ARMY ORDNANCE

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Defending the National Defense
Hon. Harry H. Woodring

The Production of Munitions
A Statement of War Department Policy

Indictment of "Passchendaele"
B. H. Liddell Hart

History–Military and General
Hoffman Nickerson

Navies in the American Revolution
Dudley W. Knox

Men and Munitions
An Editorial

A BIMONTHLY REVIEW OF AMERICAN MUNITIONS
PUBLISHED BY THE ARMY ORDNANCE ASSOCIATION, WASHINGTON, D. C.

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ARMY ORDNANCE

The Journal of the Army Ordnance Association

Now in its Fifteenth Year of Publication

Pledged to Public Service in Effecting Industrial Preparedness for War as Our Strongest Guarantee of Peace

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Volume XV **JANUARY-FEBRUARY, 1935** **No. 88**

CONTENTS

PAGE

Gen. Douglas MacArthur - Frontispiece

Defending the National Defense - - - - - - - - - - - - By Hon. Harry H. Woodring 199

The Production of Munitions—A Statement of War Department Policy - - - - - - - - 201

New Defense Equipment in Old Settings (Pictorial) - - - - - - - - - - - - - - - - - 206

Indictment of "Passchendaele" - - - - - - - - - - - - - - - - By B. H. Liddell Hart 207

History—Military and General - - - - - - - - - - - - - - - By Hoffman Nickerson 210

Navies in the American Revolution - - - - - - - - - - - - - - By Dudley W. Knox 213

Small Arms in the A. E. F. - - - - - - - - - - - - - - - - - - By Albert E. Phillips 217

First Stages of the Mexican War - - - - - - - - - - - - - - - By Martin L. Crimmins 222

Effective Bombing - By Ehrhardt C. Koerper 226

Editorial - 229

General MacArthur's Leadership—Military History Foundation—Damned if They Do, Damned if They Don't—Repairs of Arsenals—Armament Policy—How Small the Fry—Men and Munitions.

Association Affairs - 237

Col. William C. Spruance—Ralph M. Dravo—Pliny E. Holt—New Members—Necrology.

Professional Notes - 240

New Army Tank—Reserve Officer Promotion—Ordnance Training at M. I. T.

Book Reviews - 242

Index of Advertisers - 255

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"To avoid entangling alliances has been a maxim of our policy ever since the days of Washington, and its wisdom no one will attempt to dispute. In short, we ought to do justice in a kindly spirit to all nations and require justice from them in return."—*President James Buchanan, Inaugural Address, March 4, 1857.*

The Army Ordnance Association

THE Army Ordnance Association is a national organization of American citizens pledged to industrial preparedness for war as our nation's strongest guarantee of peace.

The Association endeavors to keep alive an interest in and knowledge of the design, production and maintenance of munitions. Other than a few manufacturing arsenals—six in all—there is no peace-time industry for the production of ordnance. Should war unhappily come again, industrial America will be called upon to produce munitions in great quantity and of intricate and unusual design. In an emergency time will not permit careful study or long preparation for the production of munitions. The problem is one of vital concern.

THE Army Ordnance Association believes that the solution of this problem, based on experience, lies in an active organization at all times coöperating with the Government. The principal objective of the Association is an active membership of American citizens, on whom the duty of design and production of munitions will fall in war, who will have an accurate and authentic knowledge of the complex requirements of ordnance. "Peace insurance" in this form is the foremost aim of the Army Ordnance Association.

The Association is devoted solely to the national defense; it has no commercial interests, no political alliances, and no religious affiliations. It is not operated for profit: its income is expended in furthering its aims. Its officers and directors serve without remuneration.

ARMY ORDNANCE, the journal of the Association, is published solely for the purpose of disseminating information on the progress of our munitions developments so that American industry may at all times know its responsibilities to the common defense.

The objectives of the Association as set forth in its Constitution are:

To assist in effecting industrial preparedness for war as being one of the nation's strongest guarantees of peace;

To keep available the highly specialized knowledge necessary for arming the manhood of the nation by stimulating interest in the design and production of ordnance material;

To promote mutual understanding and to effect cooperation with American scientists, inventors, engineers and manufacturers in civil life and the regular and reserve officers of the Ordnance Department;

To provide, when required, the services of competent committees to investigate and report upon special ordnance subjects;

To assist in developing and maintaining an efficient personnel, both commissioned and enlisted, for the units required for Ordnance Field Service in the event of an emergency;

To commemorate the services rendered by the industry of the nation and by the officers and civilian employees of the Ordnance Department in the wars in which the United States has been engaged.

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General Douglas MacArthur
Chief of Staff, United States Army

ARMY ORDNANCE

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Defending the National Defense

American Traditions and Ideals Must Prevail

By Hon. Harry H. Woodring*

WE come today with holy memories and with solemn hearts to this spot hallowed by the spirit of those young men, who, with no selfish thoughts of conquest or reward, nor of greed of gold, power or territory, sacrificed themselves for the life and honor of the American Nation. These warriors fought and died, seeking only world betterment and world peace. In their presence we stand to do them reverent honor, and, in meditation, to contemplate whether they sacrificed themselves in vain; whether anything has been done to ward off another such blow, and whether, if the manhood of the nation were unhappily called on today, it would be better prepared to defeat its foe with less bloodshed, less anguish, and less sorrow to all.

Comrades of the American Legion, you well remember this same day in 1918. It was a day of rejoicing for those whom God had permitted to live. It was a day of rejoicing to the thousands of mothers and fathers and sweethearts who had been hoping that the holocaust would cease, and that the weapons of destruction would be silenced forever in order that the tools of construction might again be taken in hand.

At eleven o'clock the last barrage was over. As the death-like silence spread itself over the battlefields, comrades could pause and in recollection regenerate the sensations that had throbbed through their hearts and minds while they moved forward in the hail of metal. They could recall feeling, in the presence of those powerful and death-dealing instruments, how infinitesimally small is man; how life and death are separated by mere chance. They could picture the great eternity into which, without a moment's notice, they might be thrown face to face with the great hereafter. They saw themselves moving from shellhole to shellhole, through those who had fallen with the eternal hope that they could be saved for higher things; that they would be spared so that they might serve their country even better in peace than in war.

Through the grace of God, we, here, were spared. As we look around, we see the heads of our World War veterans growing gray. The frost of time covers with its mantle many of those who went forth seventeen years ago in the great crusade against militarism. It is difficult for us to realize that our children, who were born during that era of world-wide strife, are close to the age when they begin to think for themselves. It is almost impossible for us to realize that they have no memories of the war; no lessons learned first-hand to place, for ready reference, in their book of experience.

Today marks the end of American Education Week. What more fitting time could there be to take stock and see if the minds and hearts of the youth of our nation are being exposed to any unwholesome and un-American influences; to see if our children are being taught anything not in keeping with the sacred traditions of our country, and which, if left to develop, might undermine their mental and moral fiber.

AS you well know, from its very beginning, our great country has been woefully unprepared when it found itself face to face in a conflict of arms with some other nation. Countless numbers of the flower of the youth of our Republic have been unnecessarily sacrificed, and millions of dollars have been literally thrown away because of this foolhardy policy. Has it been because we were unprepared for aggression or unprepared for defense? Our national conscience is perfectly clear on that point. We abhor aggression; yet we neglect the means for adequate defense. Has this been a disease, ravaging underground, eating at the very roots of our courage, our virility, our patriotism? Or is it from without—something that can more easily be perceived; something that can be more easily treated?

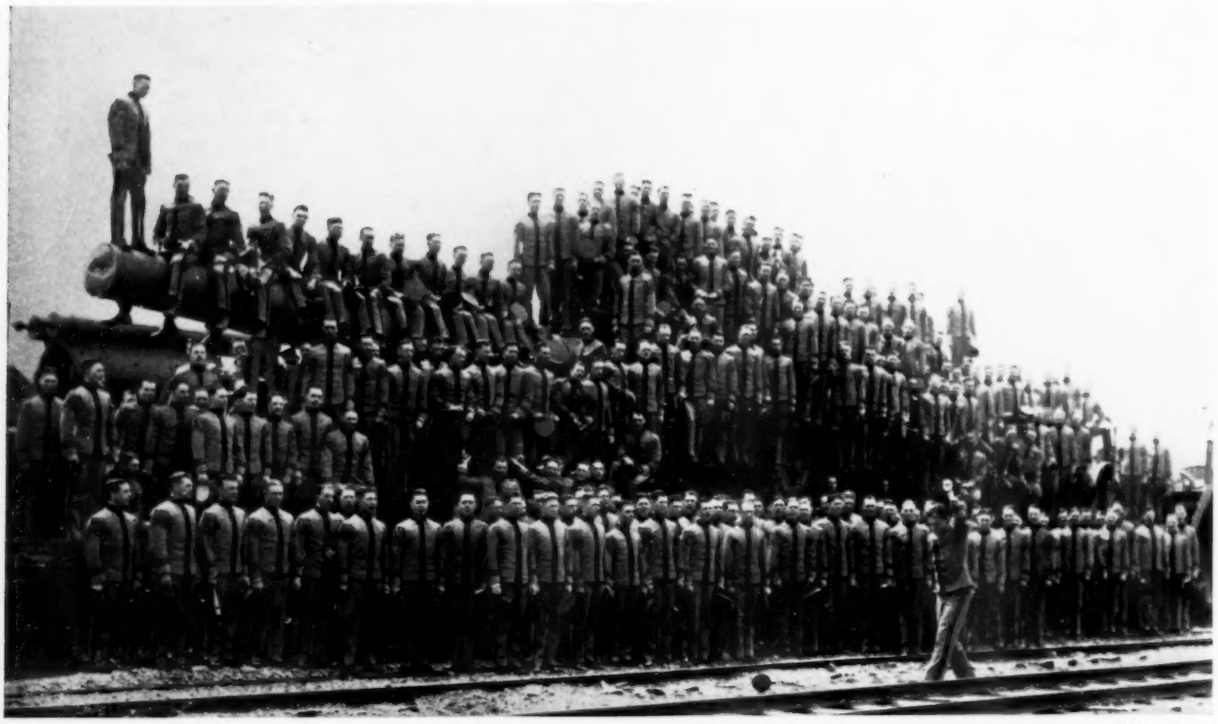
As we survey the situation, our inquisitive glance first discovers a blight covering the verdant foliage of the nation. As we look more closely, we discover what appears to be a number of parasites attacking our national resistance—our power to defend ourselves. We see a group of people taking advantage of and enjoying the bountiful benefits which this great country gives them, and yet jeopardizing the national safety, which our Constitution decrees is of primary importance, by continually advocating drastic reductions in our already inadequate protective forces, and by denying that to defend our country is the first duty of citizenship.

These citizens take a vigorous stand against any proposal to bring our military forces up to even the minimum strength necessary for putting forth an effective defensive effort. They spend their time and their money in propaganda for decreasing the Army and Navy. Those of us who went through the last conflict know full well to what folly a pacifistic policy like this leads. We have been enlightened and strengthened by experience to combat the efforts of those misguided patriots who dream of a mystic world of permanent international peace and good will.

Who of us would not do our utmost to bring about everlasting peace in this world; who of us would not exert his utmost strength to banish forever the strife and turmoil among nations? We *all* want peace—peace to which all nations must subscribe unselfishly. But we cannot stand by and watch our great country stripped of its means of defense, ready to be sacrificed on the altar of aggression when the time comes.

But what of the youth of our nation—the future defenders

*The Assistant Secretary of War. This is an address delivered at the Armistice Day Exercises under the auspices of the American Legion at Arlington National Cemetery November 11, 1934.



"DUTY—HONOR—COUNTRY" *International*

Cadets of the U. S. Military Academy at the Aberdeen Proving Ground, Md.

of our country? The opponents of national defense have recognized that in the field of education they can sow their seeds of un-American ideas with a possibility of success. For some years they have been fighting military instruction in our schools and colleges. Recently, there has been an increasing effort to solemnly pledge the young manhood of the nation not to take up arms even in defense of their country. A rolling barrage of propaganda has been loosed by the many peace societies. A bombardment of unpatriotic ideas has been turned on those to whom the nation looks for future protection and progress.

IF this movement were limited only to national defense, it would be bad enough. But its sphere as it is expanded will envelope much more. It will involve principles which will disastrously affect the moral and spiritual life of the individual; it will even strike at the roots of our democratic form of government, and I believe that, if the people of this country do not become alive to the results of these onslaughts against the very foundations of our nation, they will live to see the day when they will regret their apathetical attitude toward those movements which are shaking our national life and undermining the structure so carefully molded by our forefathers to give life, liberty, and the pursuit of happiness to those who would protect and cherish the true ideals of American tradition.

Our schools must not be debased by un-American influences. Our schools must not be the ground where the seeds of national defenselessness can be planted. Instead, our educational institutions should be our national sculptors. They should fashion the characters of our youth out of the rock of American tradition and ideals. They should model the national thought and guide it toward a greater faith in the stability and justice of the American form of government. They should instill in the hearts of our youths a greater determination to be loyal and useful citizens like their forefathers, who, by unselfish service to their country, fought for their principles and built America—today, the admiration of the world and the pride of all true Americans.

THE country confidently expects the colleges and universities to train its future leaders, whether it be in business, in the professions, or in any other walk of life. The nation places on the shoulders of our higher educational institutions the profound responsibility of making those leaders the very best. These must be of superlative caliber to lead this great nation along the path of progress and prosperity. These must be imbued with a deep appreciation of their obligations and responsibilities, not only as individuals belonging to the greatest country in the world, but also from the viewpoint of the nation as a whole. For the *government* and the *people* must work hand in hand in order for success to crown their efforts. Therefore, today let us pledge ourselves that the youth of this country *will* be brought up to appreciate the sacrifices of their forefathers; to accept willingly all the obligations of their citizenship; and to pledge *themselves* to the building of a truly American nation.

With that pledge in my heart, my thoughts return once more to those who are our inspiration. Visions of devastated cities; of destroyed firesides, and of the desolation of grief-stricken families, float before me. I see the bloodstained battlefields—the scene of many heroic and valorous deeds.

We are here today to pay homage to those who sacrificed themselves in order that the nation, with its people, might enjoy the blessings of God. Those who sleep were brave unto death; their strength is over, but their task is unfinished. So is ours, who, with high faith, courage, unselfishness, and honor, can do so much to keep this nation truly American.

The Production of Munitions

A Statement of War Department Policy

THE War Department is convinced that in the event of war American industry must produce the major portion of the required munitions. Assuming this premise, it follows that so far as practicable industry should be prepared to perform its war mission. Therefore, the War Department has consistently favored the participation of American industry in munitions manufacture and has encouraged the production of munitions not only for the United States Government but also for export where such export is not contrary to the policies of the State Department and does not divulge vital military secrets of design. This policy has been followed because it is believed that an organization or an industry that has produced munitions in peace will be better qualified thereafter to produce munitions in war.

The War Department does not oppose in any way the licensing of American industry in the manufacture of munitions, as it does not believe that control by licensing will in any way impair the efficiency of American industry for munitions manufacture in war.

THE War Department does not favor the nationalization of munitions manufacture—that is, the full manufacture in government establishments. Such a policy would fail in war, and therefore does not appear logical in peace.

The War Department's policy in this matter agrees completely with the British policy regarding the same matter, as set forth by Sir John Simon in a statement before the British Parliament, as follows:

"Our system for the supply of munitions of war to the government combines a nucleus of State production with production by armament firms and private shipyards. A nucleus of State factories is useful not only for the weapons that they themselves produce but as a check on the prices and qualities of those produced by private companies. The private armament firm has its skilled staff, its organization, its machinery—some of it extremely heavy and important. The armaments side of its business could not be maintained without foreign orders. If we are plunged into war, these armament firms and private shipyards are able to switch over rapidly from their level of peace production to their maximum of war production."

A statement outlining the considered thought of the War Department in connection with the production of munitions has been prepared, and, with the permission of the committee, will now be read:

THIS statement of War Department policy with reference to the production of munitions was presented to the Special Committee of the United States Senate Investigating the Munitions Industry. During the session of the Committee on December 21, 1934, the statement was read by Lieut. Col. C. T. Harris, Jr., Ord. Dept., U. S. Army, Chief of the Planning Branch, Office of the Assistant Secretary of War. The statement presents the following analysis:

A. Requirements.
- *1. Quantity.*
- *2. Complexity.*
- *3. Time.*

B. Productive facilities in the United States.
- *1. Government arsenals.*
- *2. The private munitions industry.*
  - *(a) Powder and explosives.*
  - *(b) Small arms and small arms ammunition.*
  - *(c) Airplanes.*
- *3. Other industrial facilities.*
- *4. Plans for the mobilization of industry.*

C. Government control and operation of the munitions industry.
- *1. Government control.*
- *2. Government monopoly in peace.*
- *3. Government monopoly in war.*
  - *(a) Initial cost of necessary manufacturing plants.*
  - *(b) Upkeep.*
  - *(c) Personnel.*
  - *(d) Location.*
  - *(e) Expansion.*
  - *(f) Artillery and ammunition.*
- *4. Relative efficiency of government and private plants.*

D. War profits.

The considered thought here expressed, its correctness of principle, its realism of approach, its soundness of viewpoint stand in marked contrast to many of the ill-considered, academic views so unhesitatingly pronounced in many quarters.

This statement will be reprinted in pamphlet form by ARMY ORDNANCE. *Copies will be sent gratuitously upon request.*—EDITOR.

A. REQUIREMENTS. *1. Quantity.* In times of peace the War Department spends approximately $100,000,000 annually for supplies and equipment. The present strength of the Regular Army and the National Guard is roughly 300,000 men. During the first year of a major war we may expect this force to be expanded to at least 3,000,000 men, or ten times the strength of the peace establishment. The requirements for food, clothing, medical supplies and personal equipment would be increased more than twenty-fold, since ordinarily less than half the troops are on active duty. It would be necessary to obtain within a short period of time an initial supply of equipment equal to ten times that in use by the Regular Army and National Guard. Maintenance allowances would be more than ten times the normal, since the wear and tear in war is much greater than in peace.

During the World War each machine gun in active service fired forty-seven times more rounds and each 3-inch field gun

180 times more rounds of ammunition than the peace-time allowance for the same period. Thus, based on World War experience, if the number of guns is increased tenfold, the expenditure of machine-gun ammunition will be increased 47,000 per cent and artillery ammunition 180,000 per cent. These figures should give some idea of the quantity of munitions required in war.

2. Complexity. Most items of munitions are highly complex and present serious difficulties in production. Field guns are made from the finest steel. Both guns and recoil mechanisms are machine finished with a nicety unusual in commercial practice. Fire-control instruments require a high degree of precision. Motorization necessitates development of prime movers and the adapting of gun carriages, limbers and caissons, to high-speed conveyance. The manufacture of artillery ammunition presents several difficult problems. Shell casings are carefully forged and machined. The fuze for a shell is as delicate as a watch. Complete interchangeability of parts is required. Cannon powder must be as nearly uniform as it is humanly possible to make it, since even relatively slight variations in quality will cause serious variations in range. Loading shell is an especially hazardous process due to the danger of explosion. Mechanization is opening up a comparatively new field where the production of such engines of war as tanks and armored cars is rapidly becoming more important. The bitter experience of the United States in the World War illustrates the difficulties of producing military airplanes in quantities.

3. Time. Not only are complex items of munitions required in enormous quantities in war, but these munitions must be available at the time and place they are needed by the troops. Time is one element in war that cannot be purchased at any price. Due to its fortunate geographical position, this country has been able to maintain a relatively lower degree of preparedness for war than most other nations. This applies both to raising troops and supplying them with munitions.

The speed with which effective mobilization can be carried out is dependent upon three factors: a. The rapidity with which personnel can be procured. b. The length of time required to organize units and train them for combat. c. The rate at which munitions can be manufactured and supplied.

For purposes of planning, the rate at which men can be procured is made the standard, and every effort is bent toward increasing the speed of the other two factors.

B. Productive Facilities in the United States. *1. Government arsenals.* At present the government has six manufacturing arsenals for the production of ordnance supplies and one for gas-defense equipment. There are no government facilities for making airplanes or communications equipment. Edgewood arsenal, which is operated by the Chemical Warfare Service, manufactures all gas masks used by the Army, Navy and Marine Corps. The six ordnance arsenals manufacture all artillery, artillery and small-arms ammunition, rifles and pilot models of tanks and armored cars. After models have been adopted, quantity production may be secured through competitive bids or undertaken at the arsenals, depending upon comparative costs and availability of facilities. The patented Browning automatic rifles and machine guns are purchased commercially. The arsenals produce about 85 per cent of the powder used by the Army. Only special powders for particular purposes are procured from private sources. At present the arsenals are producing some explosives but there are no facilities for manufacturing TNT, lead azide and mercury fulminate.

From the foregoing, it is apparent that with some expansion the arsenals could meet all peacetime requirements except for aircraft and communications equipment. However, the maximum capacity of the arsenals is only a small part of the war requirements. Present war plans contemplate the maximum utilization of existing government plants with such additions as are necessary to round out production. It is expected that such government plants will be able to produce approximately the following percentages of the estimated war requirements of twelve vital items:

Item Number	
1	0 per cent
2	less than 1 per cent
3	0 per cent
4	0 per cent
5	23 per cent
6	25 per cent
7	0 per cent
8	0 per cent
9	35 per cent
10	23 per cent
11	less than 1 per cent
12	0 per cent

2. The private munitions industry. For present purposes manufacturers of the following products may be classed as the essence of the munitions industry of the United States: a. Powder and explosives. b. Small arms and small arms ammunition. c. Airplanes.

There are no facilities equipped for quantity production of artillery or artillery ammunition. Neither naval construction plants nor mere dealers are considered.

Generally speaking, the above plants manufacture both commercial and military items. The speed with which they can get into quantity production of particular items immediately following a declaration of war will depend upon the extent to which they have been manufacturing the same or similar items in peace. No private enterprise can be expected to maintain a plant in a stand-by condition merely because such plant may be needed by the government in war. Military equipment is sold only to governments. Therefore, the business of manufacturing such equipment in this country can be kept alive only through orders from the United States Government or the development of an export business.

The status of each branch of the industry will be briefly considered.

a. Powder and explosives. Several kinds of explosives are used in war. To a very limited extent one kind may be substituted for another depending upon availability. Two kinds of powder are required, namely, small arms powder and cannon powder. Almost every size of cannon takes a different size of powder. No substitution is practicable as even a slight change in the powder will seriously affect the range of a gun. Considerable quantities of certain types of powder and explosives are sold commercially in the United States every year. However, the total production is only a small part of the amount that will be required in war. Moreover, some of the most important military types are not used to an appreciable extent for commercial purposes. This is especially true of cannon powder. Hence, the productive

capacity of existing plants will have to be expanded to the utmost. Manifestly this expansion will be facilitated if the concerns involved have peacetime experience in the production of the particular types of powder and explosives they will be called upon to furnish in war.

b. Small arms and small-arms ammunition. Between August, 1914, and April, 1917, the small-arms industry in the United States built up a large manufacturing capacity under the stimulus of orders from the Allies. As a result, after this country entered the war, requirements in small arms and small-arms ammunition were more satisfactorily met than in almost any type of military supplies and equipment.

Generally speaking, the same firms are in business today, but are not engaged to any considerable extent in the production of military items. As has already been pointed out, the United States Government is not purchasing any standard small-arms ammunition at the present time, and only a few small arms, such as the patented Browning machine guns and automatic rifles. Except for a limited export business, these firms are engaged mostly in the manufacture of such commercial items as sporting arms and ammunition, washing machines, refrigerators, cutlery, etc. In the event of war, manufacturing experience in the production of sporting types of arms and ammunition will be valuable.

However, there will be a serious initial delay due to the necessity of installing new machinery and machine tools. While concerns cannot be expected to maintain their respective facilities in a constant state of readiness for maximum production, a small flow of government orders would enable them to start production immediately after M-day. At present, Frankford Arsenal is the only plant in readiness to produce small arms ammunition during the first two or three months of a war. It is apparent that either the existing government facilities should be expanded or commercial sources should be developed.

c. Airplanes. The World War experience of the United States demonstrated the need for a healthy aviation industry. Since the war that industry has developed to a point where it will compare favorably with the aviation industry of any foreign country. The development has been facilitated by civilian and government orders and exports. Procurement plans indicate that in case of war, military airplanes would be produced rapidly and efficiently. The present rapid development of aviation with frequent changes in types and designs militates against any change to government factories.

3. Other industrial facilities. The total combined output of the existing government arsenals and the so-called munitions industry will be inadequate to meet the munition requirements of a major war. Under present conditions a large number of facilities engaged in the manufacture of strictly commercial items would be called upon to produce munitions.

The extent to which existing facilities are adapted to the particular task will vary in each case. In practically all instances new machine tools will be required, and in most, some new machinery will be necessary. Many facilities will have to be converted, and a few entirely new plants will have to be erected. The shortage of properly equipped facilities presents one of the chief reasons why anticipated production of many important items will not meet requirements in the early months of a war.

We may reasonably expect that in the event of war private plants would have fairly complete complements of personnel. One serious element of delay will be the unfamiliarity of the working forces with the manufacturing technique of non-commercial items. This will be overcome somewhat by assigning to each facility an item or items as nearly as possible like its peacetime products. It may be stated as axiomatic that an existing highly skilled organization can be instructed in a new manufacturing technique much more quickly than a new organization can be gotten together and trained.

4. Plans for the mobilization of industry. Under the mandate of Congress expressed in Section 5a of the Act approved June 4, 1920, the War Department, in coöperation with the Navy Department, has striven to improve the state of industrial preparedness of the United States. Generally speaking, this effort has taken the form of detailed plans for war procurement and the mobilization of industry.

In order to prevent confusion and delay in placing orders and to acquaint industry with what it will be called upon to do in war, tentative tasks have been assigned to particular facilities. In selecting plants for allocation, every effort has been made to secure the maximum utilization of existing facilities and manufacturing experience.

It must be recognized that while adequate plans will save valuable time, they will not alone assure immediate production of many important items. A factory can start producing at once only if the necessary machinery and machine tools are installed and the personnel is familiar with the manufacturing technique. This condition will exist only where the factory has had actual orders in peace time. Munitions in the narrow sense are sold only to governments. Hence, for American plants, orders will come only from the United States Government or from export trade.

Government orders are of two classes, viz., competitive and educational. Competitive orders are placed after advertising in the same manner that other government purchases are made. It is estimated that in the normal case a firm which receives an order will be in a position for several years to start work immediately on a new order. However, competitive orders do not always reach the firms that would be most valuable in war.

Educational orders are placed after negotiation with selected firms. Their purpose is to acquaint the firm with the work it will be called upon to do in war. In order to produce the material, machinery is installed and factory operatives receive valuable experience. Educational orders are not necessary for all classes of munitions, but are highly desirable for items such as small arms ammunition which will be required in enormous quantities immediately after war is declared. At present, such orders are not authorized by law.

The development of an export trade in munitions tends to keep alive a certain productive capacity. The more closely exported items resemble standard United States Government items the more valuable will this capacity prove. It is for this reason that the War Department has not opposed the sale of standard items to foreign governments except where military secrets are involved.

C. GOVERNMENT CONTROL AND OPERATION OF THE MUNITIONS INDUSTRY. *1. Government control.* It does not appear that government control of the munitions industry would adversely affect the state of industrial preparedness of the country. For instance, the licensing of manufacture or export should not reduce productive capacity.

2. Government monopoly in peace. The construction and

operation of factories for the manufacture of military aircraft would present a difficult problem. However, with a comparatively small increase in existing plants, government arsenals could produce all other munitions required in peace. Even with such increase, the government plants would be able to meet only a small part of the initial war load. A policy of exclusive government manufacture would tend to deprive the country of commercial sources of supply. The curtailing of orders with industrial plants will greatly increase the importance of procurement planning.

If, for reasons of policy, a decision is reached to manufacture all peace-time requirements in government plants, action along the following lines should be taken to offset to some extent the additional time that will be required to secure production from industry:

(a) Increase the war reserves of items that do not deteriorate and are not likely to become obsolete.

(b) Increase the manufacturing capacity of the arsenals, especially for the production of all types of ammunition. Moreover, all facilities should be kept in readiness to go into production. By utilizing regular personnel in key positions such an increase can be accomplished in a reasonable space of time. Any new construction should be located with due regard to security from hostile attack, distribution of products to any part of the country, raw materials, power, fuel and labor. The expansion program for artillery ammunition should contemplate the utilizing of private industry for those operations that may be performed with standard machinery and little added training.

(c) Increase the present war procurement planning activities especially with regard to the preparation of factory plans, descriptions of manufacture and the furnishing of technical information to allocated facilities.

3. Government Monopoly in War. (A) Initial cost of necessary manufacturing plants. Senate Document No. 664, Sixty-fourth Congress, second session, contains the report of a board appointed pursuant to Section 121 of the Act of Congress approved June 3, 1916, to investigate and report upon the feasibility, desirability and practicability of the government manufacturing arms, munitions and equipment.

On page 29 of that report is set out an estimate of the Chief of Ordnance as to the cost of additional facilities necessary to equip and supply forces of 2,000,000 and 4,000,000 men, respectively. The figures were:

(a) Cost of plants (additional to existing plants) required to run 1,000,000 men through first year of war, equip a second million men and run them through as much of that year's war as they will get into, and supply the necessary seacoast materiél (one-shift basis):

For sea coast materiél	$ 83,000,000
For mobile artillery materiél	246,000,000
For machine guns	15,000,000
For small arms, small-arms ammunition and infantry and cavalry equipments	152,000,000
Total	$496,000,000

(b) Cost of plants (additional to existing plants) required to run 1,000,000 men through first year of war, equip 3,000,000 more men and run them through as much of the first year of war as they could get into, and supply the necessary seacoast materiél (one-shift basis):

For sea coast materiél	$ 83,000,000
For mobile artillery materiél	608,000,000
For machine guns	56,000,000
For small arms, small-arms ammunition and infantry and cavalry equipments	180,000,000
Total	$927,000,000

The plants estimated for under (a) and (b) would be capable of fully maintaining and supplying during the second and any succeeding year of war the forces named.

The above estimate has not been revised to date, but it is believed reasonable to assume that the present cost would be greater. No allowance was made for the manufacture of tanks, armored cars, airplanes and gas defense equipment. All told, the initial cost of a complete system of government manufacturing plants capable of equipping and supplying a force of 4,000,000 men would be not less than $1,000,000,000.

(B) Upkeep. To the initial cost must be added the cost of upkeep. Plants start to depreciate as soon as they are built. New machinery and machine tools are necessary by improvement in types of military equipment. It is believed safe to assume that the annual charge necessary to cover upkeep, depreciation and additions would be not less than 5 per cent, or for a billion dollar plant, $50,000,000. If to this be added 3 per cent to cover interest on the original investment, it is apparent that the sum of $80,000,000 would be added to the annual cost of national defense.

(C) Personnel. Manifestly the capacity of plants sufficient to supply an army of either two or four million men in war would be far in excess of the needs of the peace establishment. Under any reasonably economic method of operation the number of persons employed in peace would be only a small part of the total number required in war. It would be necessary, therefore, after an emergency arose to build up a large force of skilled mechanics, foremen and superintendents. As a result, considerable time would elapse before plants could be expected to reach maximum production.

(D) Location. A large percentage of the existing private plants that would be relied upon to furnish munitions in war are located near the North Atlantic seaboard, where they are dangerously exposed to hostile attack. The same is true of most of the present government manufacturing establishments except Rock Island Arsenal. The heavy concentration of industry in the northeast section of the country increases the problems of labor, power, fuel and transportation in war. Should the government build new facilities, these could be located in the interior, where they would be relatively safe from attack and where distribution to all parts of the country would be facilitated. However, location away from the centers of industry would increase the difficulty of securing adequate skilled labor.

(E) Expansion. Plans for war procurement must be sufficiently flexible to allow for the maximum capacity a country can reach. No one can tell what kind of situation may develop in war. When the World War started the French Army had very complete plans for the production of ammunition. The following table gives the daily production as planned in 1914, actual daily production during the closing months of the war and the rate of increase:

	Planned 1914	Produced 1918	Ratio 1918 to 1914
Small arms ammunition, rounds	2,470,000	4,661,500	1.89
Artillery ammunition, rounds	14,065	222,030	15.78
Powder, pounds	48,000	577,000	12.00
Workers in munition plants	50,000	1,600,000	32.00

(F) Artillery and ammunition. It is in the field of artillery

and artillery ammunition that exclusive government manufacture would be most uneconomical. Both are required in enormous quantities and their manufacture is highly intricate. However, many of the processes of manufacture may be performed with standard machines. Both lend themselves readily to the production of component parts in different plants and later assembly at a central point. Should the government undertake to erect plants for the exclusive manufacture of these classes of equipment, it would mean that in time of peace there would be standing idle several hundred million dollars worth of machinery. In time of war this machinery would be devoted to work that might just as well be done by utilizing the machinery in a hundred private plants. In other words, the government plants would represent a needless duplication and sheer economic waste.

Under this system there will be a serious delay following a declaration of war before anything like maximum production can be reached. This situation will not be quite so serious with respect to cannon since a relatively long time is required for manufacture under the most favorable conditions. On the other hand, early production of artillery ammunition presents one of the most important problems of war procurement.

5. *Relative efficiency of government and private plants.* In time of peace, government arsenals can manufacture at slightly less cost than commercial facilities. It has been estimated that this saving will average 11 per cent. The difference is due in large part to the following factors:

(a) Arsenals make no allowance for profits.

(b) Overhead expenses are slightly lower in the arsenals and there are no selling costs.

(c) Depreciation charges are less in the arsenals because there is no question of future business. Sporadic government orders necessitate private plants entering a relatively high depreciation charge against each order.

It does not follow, however, that because arsenals now manufacture more cheaply than private plants they could do so if operated as a war monopoly. During years of peace, the enormous carrying charges on reserve facilities would more than double present costs, *i.e.,* instead of costing 11 per cent less, current supplies would cost from 90 per cent to 100 per cent more than if procured commercially. In war the necessity of building up new organizations from untrained personnel would tend materially to increase unit costs. It takes more time and costs more money to acquire these organizations than any other element of manufacture. It is doubtful, therefore, whether government plants could show any operating advantage in war to offset the deficits that would have accumulated in peace.

D. WAR PROFITS. Present procurement plans should go far in preventing contractors making excessive profits. Government departments will not compete with each other in the purchase of supplies. Forms for war contracts are being developed by which it is expected contractors' profits will be limited to a reasonable amount.

Should any manufacturer refuse to accept a government contract at a reasonable price, the law authorizes the placing of a compulsory order and in the event of further refusal, the commandeering of his plant or factory. Attempts of the War and Navy Departments to prevent profiteering will no doubt be supplemented by government regulatory measures and excess profits taxes. However, any control measures that may be adopted should not be so binding as to prevent reasonably prompt negotiations and agreement with industry to produce materials required, since any failure to procure munitions when needed may have to be paid for, not in dollars and cents but in the consequences of possible defeat.

It should be remembered that war profits are not limited to munition makers. The exorbitant demands for food, farm products, raw materials, labor, power and fuel and the withdrawal of a substantial part of industry from the ordinary channels of trade tend to cause a sharp rise in the general price level. Under any control measures that may be instituted by the government to prevent excessive prices, munition makers will fare no better than any one else.

A very pertinent paragraph of the Foreword to the Industrial Mobilization Plan is here quoted:

"The tendency to overemphasize administrative efficiency and underemphasize national effectiveness has been guarded against. The objective of any warring nation is victory, immediate and complete. It is conceivable that a war might be conducted with such great regard for individual justice and administrative efficiency as to make impossible those evils whose existence in past wars is well known. It is also conceivable that the outcome of a war so conducted might be defeat. In all plans for preparedness and policies to be pursued in event of war it must never be overlooked that while efficiency in war is desirable, effectiveness is mandatory."

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Indictment of "Passchendaele"

A Test of the Soldiers' Willingness to Learn

By B. H. Liddell Hart*

THE fourth volume of Mr. Lloyd George's Memoirs covers a wide range of subjects—among them the creation of the Imperial War Cabinet and the Air Ministry, Labor unrest and the abortive peace moves of 1917, the campaigns in Palestine and Mesopotamia, the Italian disaster at Caporetto and the subsequent creation of the Inter-Allied Supreme War Council at Versailles. Many of their lessons are far-reaching. Yet the feature which overtops all, both in treatment and in significance, is "Passchendaele." It forms what is by far the longest chapter in the volume, and is likely to make this volume the most important of the whole series. Certainly its lessons for posterity are more forceful than any.

In "Passchendaele" are summed up the hardest obstacles that the Prime Minister had to face in pursuit of victory—the obstacles of false confidence and obstinacy in error. Unlike so many of the other chapters it does not end on the note of triumph over difficulties, but is a confession of failure—none the less poignant for being couched in the author's characteristic fighting style. "It is one of the bitter ironies of war that I, who have been ruthlessly assailed in books, in the Press and in speeches for 'interfering with the soldiers' should carry with me as my most painful regret the memory that on this issue I did *not* justify that charge."

The dreadful cost of that long drawn-out agony in the swamps of Flanders used up the man-power that was needed to meet the German assaults of the following spring, and worse still, drained our moral power for a generation. "Passchendaele" is engraved more deeply on the heart of Britain than "Calais" was on Mary's. Its dire consequences justify the Prime Minister of the time—since he, and not the military leaders, is responsible to our people—in marshalling evidence to show that he strove to avert them, as far as was possible. And to any fair-minded judge he surely establishes the fact beyond cavil.

AT the time, he could hardly have forbidden the suicidal strategy without the likelihood of wrecking his Government on the rocks of public opinion—so unknown to the public was the ghastly truth of Passchendaele. He might have taken the risk had he known the truth himself—but it was deliberately concealed from him and his Cabinet. Here is the gravest part of his indictment.

"We were invited to discuss Sir Douglas Haig's plan not merely without full knowledge of the essential elements, but with a definite suggestion that the decisive facts were quite contrary to what they were in reality.

"A prospectus issued with a view to inducing the public to invest their capital in an enterprise must reveal all material facts. The Government were the trustees of the public and were asked to invest in this wild military speculation not only hundreds of millions of public money, but the lives of hundreds of thousands of brave men whom they had called to the ranks. More than that, they were invited to risk the fate of Britain on what Sir William Robertson later on called 'a gamble,' when the truth that mattered was wilfully and skilfully kept from their cognizance. . . . If the whole truth as it was known at the time, to the military staffs, had been exposed before the members of the War Committee, the Flanders offensive would have been turned down.

"As it was, we had to judge upon a basis of essential facts suppressed, distorted, and misrepresented."

By such means was sanction won for the plan which Haig propounded, and Robertson faithfully supported. Its false foundation was soon exposed—by the enemy. And by other factors of which they had known but had not told. Yet still the offensive was pressed on, long after the executive commanders and their troops had seen its futility. "It is the story of the million who would rather die than own themselves cowards—even to themselves—and also of the two or three individuals who would rather the million perish than that they as leaders should own—even to themselves—that they were blunderers."

These may seem bitter words—especially to those who have already complained of bitterness in the milder accents of Mr. Lloyd George's earlier volumes. But they are certainly no sharper, if as sharp, as those in which Haig and Robertson have spoken of him. Moreover, in fairness, one must remember that "the soldiers"—those who assume this title in controversy being usually headquarter, as distinct from fighting-line, soldiers—have been attacking Mr. Lloyd George for the past eighteen years: I can vouch for the impression they succeeded in making, since I swallowed their assertions myself until, some years after the war, I began to investigate the facts for myself. Yet during all the time of this one-sided assault, Mr. Lloyd George could have delivered a crushing retort, supported by documented facts. From this point of view his restraint for so long seems more remarkable than any severity in his eventual answer.

For my part, however, I do not discern a tone of bitterness. It is, rather, the pungency born of a natural pugnacity—decisive speech is common to most men of vigorous action. One has only to move among soldiers to realize it.

A grave historian might use some judicial phrase, milder in sound, to describe the direction of the Flanders offensive—instead of the word "blunderers." But he would mean the same thing in his own language. But whether one would prefer to see Mr. Lloyd George employ academic phrasing or not, no vital significance attaches to the form of expression. What really matters is the documented evidence he liberally provides. And this is overwhelming in effect.

LET us summarize the chief points in the indictment. Here, first, are two concerning the origins of the offensive.

1. The idea of a great offensive in Flanders was fixed in the minds of Haig and Robertson towards the end of 1916. Although not mentioned at the Conference of the Allied

*Author: Foch, The Man of Orleans; The Real War, 1914-1918; Sherman, The Genius of the Civil War; The Decisive Wars of History; Reputations; The Remaking of Modern Armies; Scipio Africanus—A Greater than Napoleon; Great Captains Unveiled; Paris, or the Future of War; The Science of Infantry Tactics. Captain, British Army, Retired.

U. S. Signal Corps Photo

Typical of the Stalemate of the Western Front

military chiefs in November, it was added to the project for the 1917 campaign just as Mr. Lloyd George was about to take office, and was untruthfully conveyed to the French by Robertson as the "desire" of his Government.

2. When the plan was originally formulated by G. H. Q., certain conditions of success were assumed: among them that (a) there must be a "very great superiority in numbers"; (b) that the enemy reserves would have been drawn away from the front attacked; (c) that it must be a swift break-through on a wide front, allowing the enemy no time "to bring up reinforcements and construct new lines of defence"; (d) that it would be dependent on the employment of a large number of tanks.

The offensive was ultimately launched without any of these conditions being fulfilled. Yet Haig himself had stated that it would not be undertaken "unless the situation was sufficiently favourable for it when the time came."

In the middle of June, Haig came over to London to lay his plans before the War Committee of the Cabinet and gain their support for his Flanders offensive. The records of the discussions that took place are given so fully that the reader can form his own judgment. The salient points that emerge are:

1. The Government was told that the offensive was desired by the French, who had promised effective assistance. They were given no hint that, in reality, both Petain and Foch had condemned the project as militarily unsound, and would have preferred us to help them by taking over more of their line.

2. The shaky state of the French armies and Haig's own disbelief that they would make any serious offensive, although expressed to his Army commanders, was concealed from the Government.

3. When the Prime Minister set forth his doubts of the offensive—in a well-reasoned document, here reproduced—and suggested instead the possibility of a combined attack on the Italian Front, the ministers were told positively, but incorrectly, by Haig that it was too late to prepare such an offensive. They were not informed that the French Commander-in-Chief actually favored such a plan.

4. In arguing for his own plan, Haig assured them that by his calculations the Allies would have a two to one superiority in infantry; that the Germans had no effective reserves; that the German morale was already weakening; that the Germans had inaccurate guns and inadequate ammunition; and that "if the fighting was kept up at its present intensity for six months, Germany would be at the end of her available man power."

Such groundless assumptions about the enemy's situation are, however, easier to excuse than the concealment of vital facts on our own side. For

5. The Government was given no hint that the ground at Ypres was liable to revert to swamp under heavy bombardment—as G. H. Q. had been warned—or that the tank experts had pointed out its unsuitability for the use of tanks.

6. It was given no hint that the rainfall statistics of the area over many years had given G. H. Q. "fair warning," as the optimistic Chief of the Intelligence has since admitted, of the improbability of the good weather that was necessary.

7. It was given no hint of the doubts expressed and objections raised by both the two Army Commanders to whom the offensive had been entrusted.

It was in this state of ignorance that they reluctantly sanctioned the project, but even then only after—

8. Haig assured them that he had "no intention of entering into a tremendous offensive involving heavy losses. His plan was aggressive without committing us too far." Robertson, the Government's immediate military adviser, concurred in this guarantee.

THE offensive was duly launched on July 31st and signally failed to achieve the instant success calculated, especially on the sector where it mattered most—thereby confirming the protest that Gough had made. But instead of abandoning the offensive, Haig abandoned his pledges.

In the middle of August Gough himself informed the Commander-in-Chief that tactical success was not possible, or would be too costly, under such conditions, and advised that the attack should now be abandoned. He "repeated this

U. S. Signal Corps Photo

AS ARMIES MOVED IN FLANDERS

opinion frequently," but was told as often, by Haig, that "the attack must be continued."

At the front almost everyone save Haig came to see its futility. At home, Mr. Lloyd George saw it as clearly, and sought to persuade Haig and Robertson that "the conditions had arisen which made it imperative that they should carry out their undertaking to the Cabinet to break off the attack."

But the facts were distorted to justify a continuance, and the fact that the fighting commanders shared his view was concealed from him. Robertson himself had increasing "doubts" and after the war he admitted that "the campaign was protracted beyond the limits of justification." But at the time, although he was the Cabinet's responsible adviser, he gave them no hint of his doubts. Instead, he passed on to them the soothing syrup which G. H. Q. distilled.

At last the Prime Minister decided to visit the front, to see things for himself. He was told by Haig and his Staff of the marked deterioration in the German prisoners. He asked to see them. He was shown a "cage" and had to admit that they were "a weakly lot." How could any civilian Minister dare to put a stop to a campaign that, on such evidence, might be so near to producing the collapse of the enemy?

"It was some years after the War that I ascertained on authority which is unimpeachable, that on that occasion G. H. Q. rang up Fifth Army and stated that the Prime Minister was coming down. . . . Instructions were given . . . to see that able-bodied prisoners were removed from the corps cages." That surely is the crowning stroke of a long course of deceit. In the case of a trivial financial investment such deceit would be a criminal matter.

Yet in this matter of life and death, to scores of thousands of their countrymen and to Britain herself, it was perpetrated by officers who were honorable men—according to their lights. There is something fundamentally wrong with a code of honor which permits such dishonesty—even from good motives. No one will question that Haig and his Staff were pursuing what they believed to be their country's good. But their conduct afforded yet another proof of the fallacy that the end justifies the means. Rather is it the eternal experience that a good end is deformed by bad means—that if we take scrupulous care as to the means, the end will take care of itself. If they had studied history deeply or thought out a philosophy of life they could hardly have acted as they did. Unfortunately, it becomes clear to a student of their recorded arguments that they had not even studied military history deeply.

These were honorable men—according to their lights. But their lights were dim. And if dim on so simple yet vital an issue of personal conduct, is it wise to assume that they saw clearly in the conduct of war? This question is relevant to the controversies that have arisen over their strategy.

WHAT matters now is not recrimination. No thoughtful student of humanity and history will desire to cast stones at their memory. He will value their virtues none the less for perceiving their weaknesses. But will the next generation learn the lesson, or will it merely confirm Hegel's observation that "we learn from history that we do not learn from history"?

Most immediately, the lesson concerns soldiers. Any value will depend on their reception of it. Will they treat the reflection of these Memoirs as an insult to their profession, and lose themselves in heated controversion of the numerous arguable minor issues? One cannot be very hopeful of a wiser attitude. Only the other day one of the ablest of our present generals, expressing his resentment of the Memoirs, said to me that he "wouldn't think of reading them." This was a man of exceptionally keen and critical mind in his own sphere, yet he closed it up like an oyster against any disturbing reflection from outside.

If this attitude to unpalatable facts prevails there can be no hope that we shall profit by experience. Can they not acquire the spirit of scientific enquiry, unobscured by partisanship or class-loyalty? Or appreciate, like one of their most illustrious forerunners, General Wolfe, that—"the more a soldier thinks of the false steps of those that are gone before, the more likely he is to avoid them." Their reception of this volume will be a test of their willingness to learn.

History—Military and General

A Plea for Vindication of the Importance of the Former

By Hoffman Nickerson*

WITH those who despise all history we are not here concerned. If they choose to exaggerate the necessary historical margins of doubt into the statement that "history is bunk," we have here no space in which to deal with them. Our argument is addressed to those who value history but would subordinate its military to its economic and social aspects.

In this matter military history does not stand alone. Whether or not the minimizers of its importance know the great work of Clausewitz, at least they appreciate his massive generalization that war is always a political act, "a continuation of state policy by other means," for their low opinion of military history is only part of a general opposition to political history both in its peaceful and warlike forms. As the epigrammatical Mencken once put it, the appearance of the Ford Model T while Taft was President was more important to the American people than anything done by the Taft administration. Without pausing to debate that matter, we may ask whether any improvement in industrial technique since 1912 is affecting American life today half as much as certain declarations of war made in 1914?

To mention 1914 is to remember melancholy and ironical facts: side by side with the present distaste and contempt for military history—not to speak of the constant prophecies of perpetual peace—our time has broken all historic periods of scale and destructiveness in war. Babbling of Utopias, we cannot even put an end to the conflict of 1914-'18; the Franco-German clash remains as definite as ever, the one difference is that for the moment the struggle is waged with gold and intrigue instead of rifles and cannon. Renewed and vast conflicts threaten. In such a predicament one would expect an intense and active study of the spiritual, moral and political causes of war. An age whose spiritual and intellectual leaders had a bowing acquaintance with the military phases of history would be everywhere asking what was wrong with the ideas which detonated 1914; no such general inquiry is on foot. Our pacifists denounce but do not analyze. Again, an era in which military thought enjoyed a broad historical basis would have searchingly examined the military theories of 1914, the technical errors which betrayed the armies into the trench stalemate of years and thereby brought the bankruptcy of half the world. Aside from the work of Ferrero, of the English General Fuller, and of the Russian Golovine, such studies have hardly begun. Most writers prefer either to imitate the ostrich with his head in the sand or to thrill with the goose flesh people who cry "Woe and alas! Our city dwellers will all be massacred by airplane bombs and poison gas the day after tomorrow."

All this challenges every man and woman capable of historical analysis. Let us historically examine not only the general ideas and the military technique of 1914, but also certain proposed substitutes like Communism or air raids on cities which promise only to make matters worse. As democracy and fevered nationalism sprouting from democracy produced both the Revolutionary-Napolenoic wars and 1914, so Communism will then appear merely as the democratic all-men-are-equal idea transplanted from politics to economics and flowering in a despotism of the familiar Asiatic type. The fervent, quasi-religious tone of Bolshevik propaganda—which our "liberals" call its "idealism"—will recall the tendency of Asiatic states to identify government with religion.

HISTORICALLY the idea of winning wars by air attacks upon cities is only a recent form of a fallacy as old as the world, that of trying to win without troubling to defeat the hostile armed forces. In the old land wars the procedure was known as raiding, usually by light cavalry; in naval wars it was and is called commerce destroying; in each case the principle is the same. Military history shows occasional successes or near successes achieved by such methods; the Viking raids of the Dark Ages ruined the high culture of Ireland and nearly snapped the tradition of civilization in Britain and Gaul, just as the German submarine raids came near defeating the Allies in 1917. But the reason for every considerable result obtained by raiding is the same: the raiders were not vigorously and intelligently opposed. The impoverished western Europe of the early Dark Ages was attempting to carry on with the old system coming down from Augustus nearly a thousand years before—a professional army and almost completely disarmed masses. The Allies of 1917 had forgotten the lessons of the old naval wars—the necessity for convoy and for flotillas of small craft. In both cases the raided had only to adopt suitable and rational methods in order to get the upper hand; the feudal organization of Western Christendom soon persuaded the heathen sea thieves from Scandinavia to accept baptism—otherwise they were cut to pieces; in '17 the convoy system and the antisubmarine flotillas turned the tables against the U-boats. So we may fairly suppose will be the case with air raids on cities.

Against those who are absorbed in the economic aspect of history we may counter attack by noting the dependence of war upon wealth. The economic limitation of war is absolute: as primitive hunters are physically unable to pursue an enemy long after the food in their own pouches is gone, but must then turn aside to kill game, gather nuts and fruit, or seize some accumulated supply, so on a larger scale must civilized states. Destroy wealth and you lower the potential of war—as in Europe today compared with 1914. Further, in the fruitful generalization of J. F. C. Fuller "the tools of peace are the weapons of war," *i.e.*, the technique by which we design and make instruments of production is necessarily available for making instruments of destruction. Indeed the same instrument often serves both purposes, for instance, knives, axes, or sporting rifles. The economic and manufacturing aspects of war suggest its financial aspect. Our time

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knows all too well what the financing of war may mean; ask any chance group of people a few questions about it and you will get some eloquent replies. And yet studies in the history of military finance may be counted on the fingers of one hand. The present writer has encountered only one of high value—an unpublished fragment left by the late R. M. Johnston in which that admirable military historian studied the interaction between war and national finance, beginning with Holland, England and France in about the year 1600.

Another absorbing interest, a sort of idol of our own day is the "common man." Everywhere you will find people saying they care little about the great of old time; what they want to know is the life of the nameless masses. "Sociology" is a word of power. Very well then, how about the sociology of war? Is it or is it not important to the common man if he be suddenly drafted by the million, shipped over seas, and made to fight people whom he has never seen? The readers of these lines will not linger over the often repeated statement that wars are inflicted upon peace-loving peoples by handfuls of powerful, wicked men. The schemers who serve so well as villains for melodrama can—at most—be only the precipitating causes, as a doctor would say, of conflicts whose underlying causes must be sought in the basic moral and political ideas of mankind.

The present writer has seen only one study which seeks to summarize the sociology of war over the last twenty-five centuries, and very few partial studies directly concerned with phases of that great affair. Nevertheless he believes that the place of military history within general history must be determined by analysis of the relation between military and social forms.

AS a basis for such analysis let us set down a few formulae. First of all war, the use of organized force between human groups, is inevitable because large areas of the human mind are and have always been full of envy, hatred, and malice. Accordingly the peace and order of mankind necessitates at least a degree of armed force sufficient for police power. Throughout history much more than this is usually found, but on the other hand men in the mass have never pushed conflict to its logical limit of exterminating defeated groups; to do so has always seemed both unprofitable and disgusting. From the beginnings of human record war has always been more or less limited.

The degree of limitation has varied enormously; at times it has approached the ideal of mere policing; again it has come near the negative, and happily unobtainable, ideal of extermination. In the history of our own European race and culture, we find the first period of full record, the time of the ancient City States in the last five centuries before Christ, to have been a period of imperfectly limited war. Throughout those centuries we find a high average of military wear and tear upon the social order, with "peaks" of destructiveness near the beginning of the period in the Peloponnesian War and at its close in the recurrent strife and civil massacre which ended the Roman Republic. But after this last climax had lasted more than a century the Emperor Augustus established the strictest limitation of war known to history. Moreover when the Augustan system gradually weakened with the approach of the Dark Ages it was replaced not by renewal of imperfectly limited war but by a new limitation, the Medieval, not so strict as the Imperial Roman but nevertheless effective. In its turn the Medieval limitation gradually weakened like its predecessor and finally collapsed in the early modern Wars of Religion, culminating in the Thirty Years War. This new peak of military destructiveness, however, was followed by a third limitation which we may call that of the Eighteenth Century. The French Revolution began the present period of democracy, mass armies, and mass massacre of which we still vainly seek the end.

Details of this summary are obviously open to debate. Either the Persian or the Peloponnesian War might be taken as the beginning of the ancient era of imperfectly limited conflict. Some readers may hesitate over the unfamiliar truth that the Augustan limitation lasted in Western Christendom until the Eighth, perhaps the Ninth Century, in the East Roman Empire even longer. Others may doubt whether the Medieval limitation was really such, although the test of the absence from destructive wear and tear upon the social order is decisive enough. The precise point at which the Medeival limitation broke down is difficult to establish. After Napoleon's fall the restored kings gave Europe a generation of peace during which armed strain existed only in Prussia. Nevertheless the outline of the great affair is clear. Taking the twenty-four hundred years for which we possess the written history of our—originally European—culture we find only eight centuries, less than a third of the whole, suffering from imperfectly limited war, against sixteen and a half during which military destructiveness has been successfully restrained. On the other hand, in the modern world of the last four hundred and fifty years we find only a century and a half, a third of the whole, enjoying successful limitation.

SIGNIFICANTLY, the three periods of imperfect and also the three of strict limitation have something in common: those of strictness are also those of moral unity, *i.e.,* substantial agreement as to what constitutes justice, whereas the epochs of imperfect limitation are times of moral disunion. Unity has been obtained by various means: in the Roman Empire it was political in that the Mediterranean world obeyed a single government, also religious in that the Emperor was everywhere worshipped as divine. In the Middle Ages it was primarily religious centering about the orthodox Catholic faith and church organization. In the Eighteenth Century it was cultural and humanistic; without universal institutions either political or religious, unity was achieved through general observance of moderation and good manners, based upon the classical culture then common both to the cosmopolitan aristocracies of today and to all educated men. Conversely, the sanctities of the ancient City States were primarily local rather than universal; sixteenth and early seventeenth century governments, through the weakening of the old, universal religion of Europe, felt themselves emancipated from moral restraint; the international and interclass cleavages of our own democratic era are all too apparent. Moral disunion produces discontent, discontent equals potential war; therefore the degree of moral disunion within any society will equal the potential of war within that society.

This first conclusion, however, does not fully cover the ground because potential is not actual war; the amount of actual war depends not only upon the potential of conflict but also upon the time it takes to get a decision. Since military decisions are matters of military technique, a technical element therefore enters the discussion. Clearly the first technical question in military history is: to what extent was a given community organized for war, and how far was it possible so

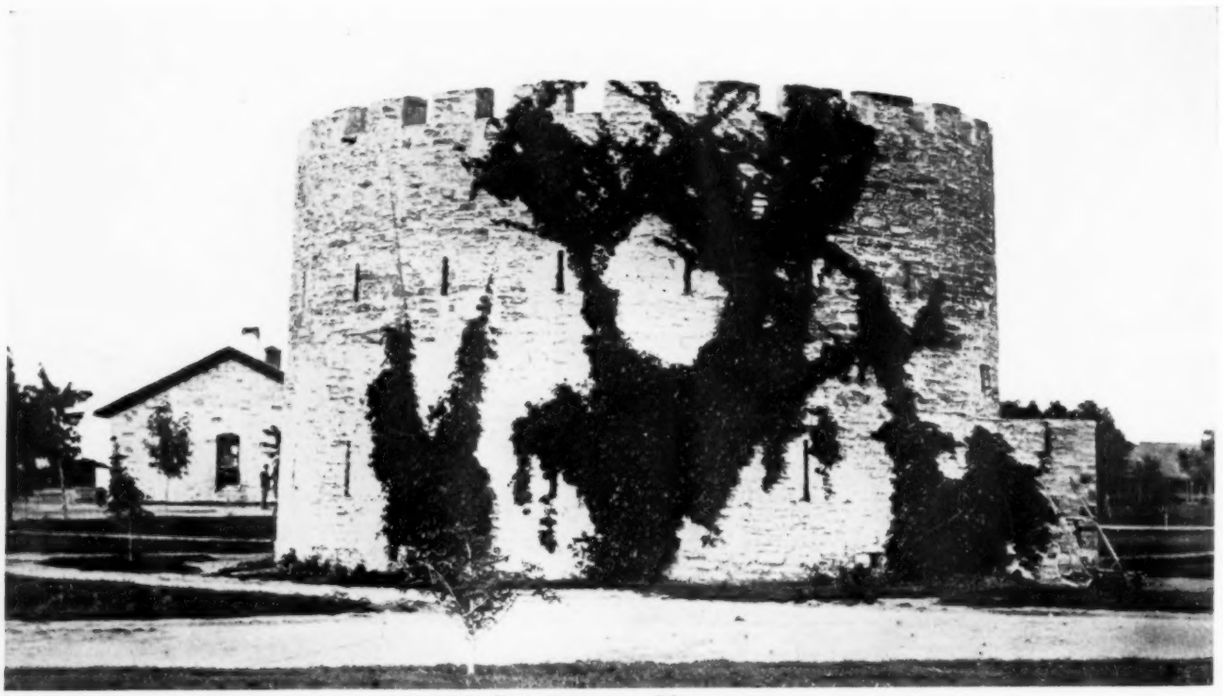
to organize it during the struggle? Applying this to the three periods of strict limitation, in each case we find moral unity creating appropriate technical limitations: the Roman Empire maintained a tiny professional army and systematically disarmed the masses so that with time they were more completely divorced from arms than ever before or since. When the Viking raiders finally compelled the impoverished West to abandon the Augustan system and organize feudally, although the upper class was everywhere warlike and all freemen were liable to militia duty, nevertheless wars within Christendom were effectively limited because men thought of themselves chiefly as Christians, only secondarily as citizens of the particular province in which they lived. This sentiment was reënforced by direct religious precepts restricting military destructiveness, also by social and financial arrangements which hindered long campaigns on any scale. Like the Roman Emperors, the Eighteenth Century worked through small professional armies and the disarmament of the masses. Moreover that century fought only for limited political objectives, colonies or frontier conquests which did not involve the total overthrow of the hostile state. By contrast our own democratic era rouses terrible popular passions, raises mass or horde armies limited only by the total resources of the fighting states, and has repeatedly aimed at the total overthrow of the hostile group.

IF we seek to analyze present trends, today the horde or mass army, the typical military instrument of democracy, seems likely to be replaced by smaller and more highly trained professional forces—a technical change which may help to bring down democracy itself. Moral unity, however, we have yet to rediscover.

If we ask how such unity might be achieved, we find all moral ideas inexplicably connected with the spiritual and religious mysteries surrounding human life. Sherman said "The legitimate object of war is a more perfect peace," to which Fuller has added "The legitimate object of peace is a more perfect man." To this again we may add "The study of and approach toward human perfection is the object of religion." While modern nations and classes continue to differ as to what constitutes justice, the imperfectly limited wars of our democratic era must continue. In order to limit them we must attempt the considerable task of replacing difference with agreement.

Sherman's phrase "a more perfect peace" suggests another fundamental point: the distinction between rational and irrational war. Clearly a true peace must be either a reconciliation or a destruction, *i.e.,* a destruction of the political power of the conquered. In no other way can quarrels be set at rest. On the other hand, whether the victor's object be the reconciliation or the political destruction of the conquered, he can achieve a more perfect peace only if his winnings are proportionate to his sacrifices. A war which leaves both combatants spiritually and materially worse off achieves not a more but a less perfect peace than that which preceded it; consequently such a war is an irrational act. Only when the game is worth the candle does war become rational. Thus it might be argued that the wars of the French Revolution and Napoleon from 1792 to 1815, also the war of 1914-'18, were irrational in that the political points in dispute were not worth the blood and treasure expended. But no one can deny the rationality of the mid-nineteenth century Prussian wars, in '64 against Denmark, in '66 against Austria, in '70-'71 against France; each won for Prussia a more perfect peace than that which had gone before. Here again technically military questions play their part.

Thus we who would vindicate the importance of military history need not confine ourselves to asking what would have happened had this or that decisive campaign ended differently. We should insist upon the vastness of social forces which avert or prepare the great conflicts, together with the fortune and skill which decide or prolong them.



OLD FORT SNELLING, MINNESOTA

Navies in the American Revolution

The Influence of Sea Power on Military Operations

By Dudley W. Knox*

THE very great importance of sea power in the Revolutionary War is too little understood. It had three main phases. First, the supply of munitions to the Continental Army, which in the beginning was practically destitute of them. Second, the extensive depredations on British commerce at sea which was one of the most important influences upon the British public towards finally desiring peace. Third, the direct naval coöperation with military operations ashore.

When the war broke out, there were practically no munitions in the colonies. After Washington took command of the Army at Boston in July 1775, he reported that it was so extremely short of indispensable ammunitions that the "artillery will be of little use without a supply both large and seasonable." For six months, he was compelled "to maintain a post within musket shot of the enemy without powder." Obviously it was an urgent necessity that munitions be obtained if the war was to be continued and Washington soon organized a small naval force near Boston to prey upon the enemy's lines of sea communications. He was early rewarded and delighted with the capture of the Brigantine NANCY with a cargo of munitions by the American Schooner LEE under Captain Manly. It was estimated that eighteen months would have been necessary for such a quantity of munitions as was carried by the little NANCY to be manufactured in this country with our meager resources of that day.

Naval expeditions were organized also to capture munitions from British stations at Bermuda and at New Providence in the Bahama Islands. A squadron of six continental vessels under Commodore Hopkins was very successful in his attack upon the latter place and brought back to New London a very considerable quantity of heavy cannon and other military stores. Practically throughout the war the Continental Navy, together with American privateers were engaged in capturing enemy munition-carrying ships and in convoying American ships with supplies bought abroad. This was the main source of munitions for the American Army at least until the French alliance.

WITH regard to the second great influence of sea power upon military affairs, the damage done to British sea borne commerce is indicated by the fact that over 3,000 British merchantmen were captured during the war. This was not only a direct financial loss to British trade but the constant menace of American raiders kept insurance rates at a very high figure, which was an additional burden of great importance upon British commercial life. As has been stated, the steady mercantile losses was one of the main reasons for the British public finally coming to a state of mind favoring peace.

Courtesy of Carnegie Institution of Washington from a Contemporary Sketch in the Louvre

THE FRENCH VAN OVERTAKING THE BRITISH REAR, AUGUST 10, 1778.

The British are in two columns at the left, and the main French fleet in the distance at the right. The onset of bad weather broke off the action and a subsequent gale scattered and damaged both fleets.

With respect to the third point of direct naval coöperation with military operations ashore, during the first three years of the war when we had no allies, it was a normal condition that the vastly superior British power on the sea gave them perfect freedom to strike at will on our very extensive sea coast. It was because of their sea power that they were able to concentrate superior land forces against us in Canada, and at Boston, New York, Newport, Virginia, Savannah and Charleston. The Continental Army was frequently exhausted from its marches to meet landings of troops transported by sea, and so never able to meet them adequately.

The only exception to the British advantage in the above respect during the early part of the war, was the naval operations on Lake Champlain by General Arnold. It will be recalled that the British plan in 1776 was to advance northward from New York with the main army while another army of

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13,000 troops were to come down by Lake Champlain to take Washington in the rear. It was Arnold's temporary naval control of Lake Champlain which prevented the success of this plan. For practically the entire summer he enjoyed control of the Lake with his fleet of small vessels and forced the British to build a superior fleet before their military advance could be undertaken. When finally Arnold's fleet was destroyed by this superior British naval force, it was too late in the season for the northern British army to proceed with the campaign, and for this reason the southern British army gave up its northerly pressure on Washington and crossed the Hudson into New Jersey.

In the following summer General Howe changed his strategy and moved his army by sea from New York to the head of Chesapeake Bay, where he disembarked and marched on Philadelphia. Had he stuck to the strategy of the previous year, it is very doubtful whether the victory at Saratoga in October 1777 would have been possible.

One of the most striking examples of the potent influence of sea-power upon military operations was afforded by the evacuation of Philadelphia by the British Army in 1778, and its hurried retreat across New Jersey to New York. Nearly 20,000 British regular troops left the security of a well fortified city pursued by only 12,000 Americans scarcely recovered from their rigorous winter at Valley Forge. There was no visible reason. Word had been received about six weeks previously of the Franco-American alliance and there were reports of a French fleet fitting out at Toulon which might come to the United States. That was all.

The communications of the British army in Philadelphia had been down the Delaware River and thence by sea to New York or England. The danger lay in having these communications cut by a superior French naval force. That the danger was real is shown by the arrival of the French fleet under Admiral D'Estaing only a few days after the British transports carrying the heavy baggage and stores of the army had passed out of Delaware Bay towards New York. The British army with the Americans hanging on its rear was then only half way across New Jersey.

The arrival of the French fleet was hailed with great joy by Washington, who set about at once trying to arrange a concerted attack on New York, by the American Army advancing from the north while the French fleet should force its way into New York harbor against the greatly inferior British naval forces which were present there. D'Estaing accordingly proceeded to Sandy Hook but found the very energetic Admiral Howe had anchored his much smaller force directly across the channel and was prepared to offer strong resistance. There was some question about the depth of water in the channel being sufficient for the great draft of the heavy French ships, and D'Estaing finally decided that this was a risk not worth taking. He therefore proceeded to Newport, then in the hands of another British army of about 6,000 men.

Courtesy of Carnegie Institution of Washington from a Contemporary Sketch in the Louvre

D'ESTAING'S SHIPS-OF-THE-LINE FORCING THE NEWPORT ENTRANCE, AUGUST 8, 1778.
The fleet is under the fire of British batteries on the right located near what is now Fort Adams.

While Washington was disappointed that the New York enterprise had not been chosen, he nevertheless sent word to General Sullivan to coöperate with the French fleet in the fullest manner possible in a joint attack against Newport. Sullivan and Lafayette mobilized nearly 10,000 American troops for that purpose and when Admiral D'Estaing forced the Newport passage on August the 8th, they made preparations for an attack. Four thousand additional French soldiers were landed on Conanicut Island preparatory to joining the Americans across the Bay.

Against these land forces it was obvious that the British army was doomed in a comparatively short time, especially because their water communications had been completely cut by the French fleet. We had here a situation closely analogous to that which brought about the surrender of approximately the same sized army at Yorktown in 1781, which terminated the war. Had this British army been taken at Newport in 1778, following within ten months after the surrender of 3,500 British troops at Saratoga, the Revolutionary War might well have been won for us at that time.

The French army had scarcely been landed, however, before the British fleet from New York arrived off Point Judith outside the harbor about eight miles distant. The British had received reinforcements in ships from England but the squadron under Admiral Howe was still substantially inferior to the French fleet present. Howe had come from New York with the idea of merely profiting by any unexpected opportunity which might offer and he got word to the British General Pigot in Newport that it was "impossible to afford the General any essential relief."

Though himself a soldier, D'Estaing made a very unwise decision, temporarily giving up the investment of Newport for the sake of attempting the destruction of the British

squadron off Point Judith. Accordingly he reëmbarked his troops and sailed after Admiral Howe, who retreated under all sail before the wind. The chase continued for thirty-six hours and just as the French were coming within range a great gale arose which scattered both fleets and damaged many ships.

The British reassembled in New York and the French Admiral after making temporary repairs at sea limped back to the offing of Newport. He still held the British army there in the hollow of his hand. Just before his arrival General Pigot had sent a despatch to Howe saying that "the rebels ashore had advanced their battery within 1,500 yards of the British works," that he was "under no apprehension from any of their attempts in front, but should the French fleet come in it would make an alarming change." He feared that "troops might be landed and advanced in his rear" and in that case he "could not answer for the consequences."

Despite the still very promising military situation Admiral D'Estaing thought that his ships were in too bad a state of repair to warrant his remaining in that vicinity, and therefore decided to proceed to Boston, where the only adequate repair facilities existed.

This ended the naval operations in northern waters for some time, because in the following November the French fleet sailed for the usual winter operating theater in the West Indies.

A REVIEW of D'Estaing's operations on our coast discloses that the forced evacuation of Philadelphia was practically the only military accomplishment, yet it is clear that the potentialities at his command were much greater. These may be estimated from Mahan's eulogy of Admiral Howe, D'Estaing's naval opponent. Mahan said, "With a force inferior throughout, to have saved in one campaign, the British Fleet, New York, and Rhode Island, with the entire British Army, which was divided between those two stations and dependent upon the sea, is an achievement unsurpassed in the annals of naval defensive warfare."

Perhaps the greatest effect of D'Estaing's operations was in the naval education of Washington. The close margin by which decisive victory had been lost was a revelation to our great commander-in-chief, and throughout the remainder of the war his land strategy revolved around joint operations with a superior naval force which he constantly planned for and hoped to obtain.

In 1779 D'Estaing came up from the West Indies and attacked Savannah, and Washington received erroneous information that he would subsequently come north. Washington therefore made great preparations for a joint military-naval attack upon New York, mobilizing large additional troops which were held in readiness until the news of D'Estaing's departure to France, and then Washington demobilized his surplus units.

From a contemporary sketch by a French naval constructor now in the Louvre. (*Courtesy of Carnegie Institution of Washington*)

D'ESTAING'S FLEET OFF SANDY HOOK, JULY 12 TO 22, 1778.

The British fleet may be seen in the background anchored across the channel into lower New York harbor

In the succeeding year of 1780 when Rochambeau arrived at Newport with 6,700 French troops and was eager to employ them actively in the field, Washington laid it down as a fundamental condition for further military operations that "In any operations, and under all circumstances, a decisive naval superiority is to be considered as a fundamental principle and the basis upon which every hope of success must ultimately depend." Afterwards, in summing up the 1780 campaign, Washington wrote to Franklin, "Disappointed . . . especially in the expected naval superiority, which was the pivot upon which everything turned, we have been compelled to spend an inactive campaign, after flattering prospects at the opening of it."

IT is not necessary to follow in detail the well-known Yorktown campaign, in which Washington finally succeeded in obtaining the due coöperation of a superior naval force to be used jointly with the combined French and American armies. We need only survey it in broadest outline. A French fleet sailed from France via the West Indies, to a junction at Yorktown with a French army marching from Newport, an American army marching from above New York, an American army in Virginia and a French naval squadron sailing from Newport. Here we have grand strategy on a scale of magnificent distances, with the stakes of not only a continent but also the free development of a great people.

By strategem Washington kept the British army in New York in doubt as to his objective, and while he was crossing the Delaware River Admiral de Grasse arrived at the Chesapeake entrance. The British fleet had also come up from the West Indies and it hastened to the relief of Cornwallis. This brought the two fleets into an action which lasted intermittently for several days off the Chesapeake entrance, and

Photograph of an oil painting presented by Charles H. Taylor, Esq., to Navy Department Library (1934)

THE ARRIVAL OFF NEWPORT OF THE COUNT DE ROCHAMBEAU COMMANDING A FRENCH ARMY OF 6,700 TROOPS IN 36 TRANSPORTS, ESCORTED BY 7 SHIPS-OF-THE-LINE, 5 FRIGATES AND 4 SMALL ARMED VESSELS, COMPRISING THE SQUADRON OF THE CHEVALIER DE TERNAY.

At daybreak, July 11, 1780, in a thick fog a transport warned the fleet of land ahead. As the fog lifted Point Judith appeared about 3 miles distant. At the shore lookout station the French flag was flying (fleur-de-lis on a white ground) together with a signal prearranged by Lafayette "Rhode Island in American hands and welcome."

resulted in the British Admiral giving up his crucial objective at Yorktown and retiring to New York.

But for the success of the French Admiral in preventing the entrance of the British fleet into Chesapeake Bay and in forcing its withdrawal, Yorktown would not have surrendered, and the war would have continued in its same inconclusive course. It is perfectly apparent that had the British controlled Chesapeake Bay, the subsequent movement of the French and American armies from the Head of Elk by water to Jamestown could never have been effected. The armies might have marched laboriously over-land, but before they could have reached Yorktown, Cornwallis would have been substantially reinforced or evacuated by the British fleet. Until the last stages of the siege Cornwallis held on in the hope that the fleet would finally come to his relief. So long as he held such a hope, he was fully warranted in maintaining his position. When that hope was gone he promptly surrendered before there had been much fighting.

In writing to Admiral de Grasse a few days after the victory Washington said, "You will have observed that, whatever efforts are made by land armies, the navy must have the deciding vote in the present contest." No better summary could be made of the influence of seapower upon the military operations in the Revolutionary War.

Small Arms in the A.E.F.

Some Problems of Supply and Maintenance

By Albert E. Phillips*

THE magnitude of the problem that this article discusses cannot be conveyed by a title. Fully to comprehend its scope it is necessary to be familiar with the types of small arms in the American Army when we entered the War; the types later forced on American troops by the peculiar conditions existing at the time; the strategical and tactical employment of American divisions and the supply and repair facilities. No other army has ever had a similar problem.

Before the World War, to supply an army with ammunition for rifles alone was considered a difficult problem. When our troops were testing various types of machine guns, years before the War, the question was asked: "Where are we going to get ammunition to fill the circumambient atmosphere with bullets?"

The machine gun was an American invention. It was used by our troops during the Spanish-American War and at various times since, and it played an important part in the fighting of contesting armies in the World War for three years before we entered the War. The American Army, however, was not equipped with machine guns when we declared war in 1917, and for the greater part of the War, our divisions arrived in France without them. From 1906 to 1910 the Army was equipped with the Vickers-Maxim—a real machine gun, capable of sustained power, the gun mounted upon a tripod for required stability in overhead, barrage and indirect fire. In 1910 a board of officers recommended adoption of the Benét-Mercie—a machine rifle with light, bipod mount and shoulder rest—a weapon not capable of sustained fire and a mount unsuitable for either barrage or overhead fire. The Benét remained the automatic small arm of the Army until 1917. It might well be stated here that the board recommending adoption of a machine rifle in 1910 apparently did not foresee the high development of machine gun fire technique. No type of machine rifle, Benét, Lewis, or other, could supplant the machine gun—and such weapons are too heavy to be carried by infantry soldiers for automatic rifle work. The machine rifle has its place in battle but that place is a supplement to, and not a substitute for, the machine gun. The British Cavalry and British Tanks used the Benét through and after the World War—but this was for machine rifle duty.

OUR rifle armament originally consisted of the Springfield, which was later supplemented by the Enfield caliber .30, thus giving us two types of rifles. Our pistols were of three types, the Colt automatics and revolvers of caliber .45 and Smith and Wessons. We did not have an automatic rifle previously to our entrance into the War; this was the first great opportunity for the use of automatic small arms in war.

With the proposed plan of close coöperation with the French Army and a source of supply in France, we adopted, for the first twelve American divisions to arrive in France, the French types of machine guns and automatic rifles—the Hotchkiss machine gun and the Chauchat automatic rifle, both 8-mm. caliber. The Hotchkiss was a rugged air-cooled gun.

The Chauchat was a crude weapon hastily designed by the French to supply their automatic rifle requirements. We accepted it with reluctance but proceeded promptly to change its caliber from 8-mm. to .30. This, however, required several months.

A machine-gun Board in 1917, after a test of automatic weapons had been made, had recommended the adoption of the Browning machine gun and the Browning automatic rifle of American caliber .30; but these weapons could not be expected to reach France for at least another year—the late summer or fall of 1918. The War Department in the meantime had ordered some 4000 Vickers machine guns of caliber .30; these, too, could not arrive before the summer of 1918.

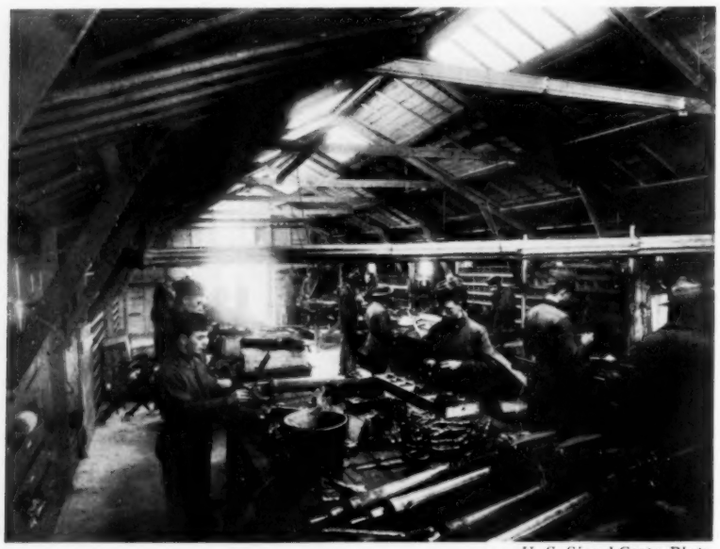
Here, then, was a picture of three types of machine guns of two calibers; two types of automatic rifles, each of a different caliber; two types of rifles; and three of pistols. A difficult, complicated problem of supply and repair loomed ahead, and it became necessary to prepare a plan fully adequate to meet it; but this was not all that was required, as we shall see later. The strategical disposition and tactical employment of divisions also had to be considered. In solving the problem there was no precedent to follow. Both the British and the French had but one caliber each and but one type each of machine gun and automatic rifle in the infantry. The British had the Vickers .303 machine gun and the Lewis .303 automatic rifle; the French, the 8-mm. Hotchkiss machine gun, and the Chauchat 8-mm. automatic rifle. The French also had the St. Etienne machine gun as a *sector gun*. The British Cavalry had the so-called light Hotchkiss (Benét-Mercie) machine rifle, but it presented no problem of importance.

The British and French systems were studied, and it was ascertained that only one feature applicable to either army could be adopted, and that this feature was already a settled policy in our Army; namely, that each rifle soldier should carry a rifle forward. British rifles and small arms generally were shipped to England for repair. Divisions maintained small repair shops for immediate necessary repairs only. The French had established "automatic arms centers" on a small scale with the Hotchkiss and Chauchat plants in France as bases. Our problem was greater, for the reason that we could not use these plants, as our dealings were with and through French supply authorities for the supply of French arms, and all small arms of the American armies would have to be supplied from, and repaired in, our own installations in France.

American facilities at this period (early 1918) consisted of a base shop in the rear area, in the making, and a small depot shop

*Chief of the Ordnance Machine Gun and Small Arms Field Service, A. E. F., attached to G4, G. H. Q. British authorities credit him with originating indirect machine gun fire several years before the World War. Colonel, Cavalry, U. S. Army.

at Is-sur-Tille,—at that time the most advanced general supply depot and regulating station; a mobile ordnance repair shop "authorized" for each division, and rifle spare-parts chests with each infantry regiment, with Ordnance personnel attached to each regiment and machine-gun battalion. This personnel had not received any special training on automatic arms; it would have been impracticable during battle for these men to attempt to repair arms. The only machine-gun spare parts in the divisions were those in the company kits. There were no automatic-rifle parts and no spare automatic weapons in divisions. The depots maintained an accountability system and were seriously hampered in maintaining a supply of parts and in filling requisitions. Troops did not even know the correct nomenclature of many parts. Hundreds of requisitions for parts were flooding the depots; and this need for parts was serious, as a shortage of a few machine-gun parts would put a whole machine-gun crew out of action.



U. S. Signal Corps Photo

Machine Gun and Automatic Rifle Repair Shop—American Expeditionary Force, 1918.

General staff plans had made Is-sur-Tille the small-arms repair center; but Is-sur-Tille was too far to the rear to be used as a base for the division shops. It was clearly evident that we should have portable advanced bases for the division mobile shops, and that these advanced base shops should be stocked with all types of automatic weapons and related equipment in use, with only a small stock of rifles, and with facilities for the repair of all types of small arms. It was also obvious that all regimental rifle repair-chests should be called in and all repairs centered in the division shops and in these proposed portable advanced bases. Damaged weapons should be exchanged or replaced by the division shops without red tape or delay. In turn, there should be no accountability by the division shops, all supplies and equipment being obtained from the advanced bases by a system of semi-automatic supply, requisitions to be used only for special cases.

THE division mobile ordnance repair shops consisted of three machine-shop trucks and three equipment repair-trucks with auxiliary vehicles and personnel. The trucks were splendidly equipped for all repairs except major repairs of artillery. The personnel left nothing to be desired. The officers were nearly all mechanical engineers, and the men had come mainly from manufacturing plants. The technical or administrative division of the shop into a *"machinery section"* of the three machine-shop trucks and an *"equipment section"* with the three equipment repair-trucks proved faulty and was changed. The Artillery had long felt that the machine-shop trucks belonged to that arm; and on two occasions when division artillery had been moved to support some other division, the three machine-shop trucks had been taken along, thus leaving the original division without a machine shop for rifle and machine-gun repairs. I then effected a technical reorganization of all division shops so that these shops could function along tactical lines. This reorganization provided an "artillery section" of two machine-shop trucks and one equipment repair-truck for the Artillery, and a "small-arms section" of one machine-shop truck and two equipment-repair-trucks for the Infantry and machine-gun units of the divisions, and thus avoided further difficulties. The artillery section only, thereafter, accompanied artillery brigades on detached supporting missions. Two light ¾-ton delivery trucks were added to each shop.

RECOMMENDATIONS were submitted by me for the organization of "Army Machine Gun and Small Arms Centers," one for each army, in the army zones. My plans for the establishment of the first of these centers were as follows:

The centers were to be the bases for the division mobile shops, with the necessary stocks of all types of automatic arms and accessory equipment, spare parts, etc., and the machinery and personnel for repairs and issues. And each center was to have its own trucks for the necessary replenishment of stocks when rear depots could not meet requirements *and for special use in supplying forward echelons which would be established during battle;* all buildings were to be easily portable.

The division mobile shops were to have no accountability and were to obtain supplies from the "centers" by semi-automatic replenishment and by requisition in special cases. The division shops were, in turn, to keep in close touch with all division units and to exchange damaged weapons or replace lost weapons. Each division shop was to be given a small supply of the machine guns, automatic rifles, pistols, spare parts, etc., with which the division was equipped. As the division shops would have their own trucks, these trucks should normally come to the machine-gun centers for supplies. Rear depots should forward supplies to the centers; but if there should be any possibility of delay, the trucks from the centers should go to the depots. A reserve of division mobile shops should be provided.

It was easily foreseen from the contemplated use of our divisions, here and there, with the British and the French, that we should also have a number of these division mobile shops, in addition to those in the divisions, constantly in reserve. We had two of these shops in reserve, obtaining them from replacement divisions. This feature of the plan proved itself on numerous occasions most practical, as it provided a reserve shop which formed a temporary base for two or

more division shops. These reserve shops were under my control for use when and where needed. The machine-gun centers likewise were organized, established by and operated under my personal supervision. For this duty I was temporarily assigned to the 1st Army in addition to duty with the G-4 Section, G. H. Q., thus holding dual assignments.

Our Army was planned on 30 divisions; our corps on 4 combat and two replacement and training divisions. There were 224 infantry machine guns, 36 with the artillery batteries, and 768 automatic rifles in each division. Our corps had as many machine guns and automatic rifles as a French army of 12 divisions.

Inasmuch as each rifle soldier would come forward with a rifle, the main rifle repair facilities were located in rear shops. The army machine-gun centers carried a stock of 2,000 rifles, while the division shops had a normal supply of 100 rifles for replacement purposes. There was a surplus of rifles in the division shops shortly after the start of battle. The principal need for the issuing of rifles at the front was to supply the men who had returned to duty from an evacuation or other forward hospital and also to supply special detachments of troops working temporarily in forward areas such as Signal and Engineer troops.

With the establishment of "regional troop replacement depots" in forward areas during October, 1918, additional salvaged rifles were repaired in the army machine-gun centers and forwarded to these troop depots; but this was a temporary requirement as the troops, generally speaking, were equipped by the rear depots.

A SECTION OF THE PISTOL AND RIFLE REPAIR UNIT—AMERICAN EXPEDITIONARY FORCE, 1918.

THE situation in automatic arms was quite different from that of rifles, the problem therefore requiring a different solution. There was a shortage of all automatic arms, even those of the French types, for French army requirements had to be filled before we could get our share. The American automatic arms would be slow in arriving; and even after these arms had arrived, we could not expect spare parts for several months, and a shortage of a part would put a machine-gun crew out of action. All automatic arms, therefore, except the few that were unavoidably mixed in with rifle shipments going to the rear, were repaired in the machine-gun centers.

The first 12 divisions, as previously stated, were equipped with French Hotchkiss machine guns and Chauchat automatic rifles. The majority of the divisions arriving later brought over Vickers, caliber .30 machine guns, but no automatic rifles. To fill this automatic rifle requirement a quantity of Chauchats of caliber .30 were manufactured in France. This caliber, of course, simplified the problem of ammunition supply to divisions but imposed additional burdens on the supply and repair centers by having two calibers of Chauchats.

Browning machine guns and automatic rifles did not arrive in France until the late summer of 1918, the 79th Division being the first to arrive in France equipped with these weapons and the first division to use them in battle. The 80th Division was the first to be equipped in France with the Brownings. The policy of re-equipping divisions with Brownings was first to replace the Vickers with Brownings, and later to replace the Hotchkiss. Vickers caliber .30 were becoming difficult to obtain, and, furthermore, the first twelve divisions had become thoroughly familiar with the Hotchkiss. Many divisions preferred to retain the Hotchkiss on account of its longer range and their familiarity with its trajectory.

There was great difficulty at times in obtaining the Hotchkiss and Chauchat. The French Ministry of Armament would replace each month only the actual expenditures of the previous month. Our depot supplies were limited. A situation arose during the battle of the Argonne in which it was imperative that there should be ample supplies in our machine gun centers, also promptness in filling of our requests and in shipping equipment. To secure this service I proceeded to French G. H. Q. and laid our demands before the higher authorities; and got results. To assure prompt shipments we placed an American officer and ten men at the French regulating station of Noisy le Sec, just east of Paris, to handle our shipments and convoy them to their destination. This arrangement enabled us to receive French arms in four days after ordering them. Without this arrangement of convoyers we should have been unable to meet the requirements for French arms in the Argonne.

THE first machine-gun and small-arms center was established at Void (Meuse) near the intersection of the Paris-Nancy (E-W) Neufchâteau-Commercy (N-S) highways. This unit was established in the early part of 1918 before organization of the First Corps; its success was instantaneous, and the unit proved our most important center.

Now for a few interesting details of operation. This center and the facilities at Is-sur-Tille were used for the training of a corps of automatic arm specialists, who were sent to newly arriving divisions in order to supervise the technical training of troops in the handling of the particular types of automatic arms with which the divisions were equipped, and later, particularly, to take charge of the training whenever it became necessary to replace types of weapons. And in a few divisions several changes occurred, as we shall see. Many of these officers were also trained in the technique of fire.

The Third Division had but recently arrived in France

and received its allotment of French automatic arms when it was ordered to the Château-Thierry area. The division had but little knowledge of either the mechanism or the trajectory of these weapons, and in one case a unit tried to fire them without first removing the cosmoline. The division did not have a mobile ordnance repair shop at this time, and none was available. I, therefore, used trucks from the machine-gun center and proceeded to the division with improvised equipment, mechanics and officer automatic-arms specialists, supervised the hurried training of the troops and provided them with maintenance facilities.

The 7th M. G. Battalion of this division played one of the most heroic parts of the War in stopping the crossing of the Germans at the bridge at Château-Thierry. One other interesting episode occurred in this division in which the first machine gun center again proved its worth. The regimental machine gun company of the 38th Infantry ("Rock of the Marne" regiment) had been completely destroyed. A telegram was sent to G. H. Q. ordering one machine gun company, Hotchkiss, complete. Colonel De Witt, G-4 of the Army, in the meantime, met me in the division area and told me of the requirements. In one hour the equipment,—guns, carts, and accessories,—was in trucks and en route to the division from the first machine-gun center at Void.

The 2d Division, with French automatic arms and U. S. rifles, and the 36th Division, with Browning machine guns and automatic rifles (the 36th had brought Brownings from the United States), were in battle in the Argonne when orders were received overnight attaching them to the French 4th Army west of the Argonne. There were no spare parts for Brownings in France at the time, and the 36th Division had not yet received its mobile repair shop. Small-arm ammunition supply and repair facilities for two American divisions in a French army had to be provided. A temporary shop from the machine gun center at Void, with a few spare Brownings, was provided to care for the 36th Division. The 2d Division had a mobile shop.

The 37th and 91st Divisions, equipped with American Vickers machine guns and French Chauchat automatic rifles, were transferred hurriedly from the Argonne sector for duty in Belgium. A "division mobile shop," held in reserve, was hastily outfitted with appropriate weapons and parts and provided the necessary machine-gun center for these two divisions. This temporary center was located at Couderkerque—Branch, near Dunkirk.

The 80th Division arrived in France with American Vickers caliber .30 machine guns. It was ordered first to serve with the British and to receive British Vickers caliber .303 machine guns and British Lewis guns. The division later was transferred to the American Army and, of course, gave up its British automatic arms. It was re-equipped with American Vickers (as Brownings were not yet available) and fought its first battle on the American Front in the Argonne with these weapons. Upon coming out of battle, a shipment of Brownings had arrived at a base port in France, and the division made a special request that it be equipped with these weapons. The Brownings were hastily shipped by truck across France, and the 80th Division was equipped with these arms. But rapid and thorough instruction was necessary, not only in the mechanisms but also in the technique of fire, for the division had again received orders to return to the line.

I threw in my entire corps of machine gun instructors, including Lieutenant Browning, the son of the inventor, to make sure that this division would give a good account of itself with these new automatic arms. The instruction included indirect fire. As a result of this instruction the Division reported: "The rolling-barrage of machine-gun fire, involving three quarters of a million rounds of caliber .30, prepared the way for the assault troops. The sector of attack was thickly defended by machine-gun emplacements of concrete which, while open at the top, were almost impregnable to frontal attack by infantry troops. The indirect fire conceived and taught by Colonel Phillips wiped out the crews of many of these miniature pill boxes and the resultant saving in the lives of the attacking force cannot be measured."

OUR corps of four combat divisions usually had two types each, of machine guns, automatic rifles and rifles. In a few instances, notably in the Argonne, there were all three types of machine guns in use in some corps—Hotchkiss 8-mm., Vickers and Brownings, caliber .30, and the three types of automatic rifles—Chauchats 8-mm. and caliber .30, and Brownings. In normal periods of position warfare, issues of weapons were made to divisions upon requisition through the Army Ordnance office on the machine-gun center. In these instances the weapons would usually pass through the division mobile shops, although in emergencies troops made direct call on the division shops for weapons. Parts and service were always furnished on direct call. But the system of forwarding all requests through the Army Ordnance office for the supply of weapons and ammunition, once the corps became engaged, would not meet the requirements of a corps or army battle. The shops were busy with repairs. The corps had several types of automatic arms, and divisions in each corps were frequently replaced.

Normally, machine-gun troops filled their own cartridge belts. In periods of active fighting, whether of position warfare or of offensive operations, corps automatic arms dumps or advanced supply echelons for each corps were established from the machine gun centers. These echelons or dumps carried a supply of all types of automatic arms used by the corps and also a *supply of ammunition put up in belts or strips ready for use*. All weapons were prepared for immediate use. These dumps were usually established in a central location *forward* of the division shops. Instructions were issued to all combat units authorizing them to make direct call on the dumps. Authority to make direct call was objected to by some supply officers, but experience showed its necessity, for supply officers were often engaged elsewhere when these supplies were needed. The corps automatic arms dumps were therefore essential. The supply of several types of machine guns and automatic rifles to a corps in battle is quite a different problem from any other form of supply.

During the battle of St. Mihiel and the first phase of the Argonne the machine-gun center at Void was maintaining the automatic-arms equipment (and many rifles and pistols) of twenty divisions. There were 1,138 spare parts for small arms carried. A system of semiautomatic supply for parts was effected between the machine-gun centers and the division shops. With the completion of the St. Mihiel offensive and the transfer of the 1st Army to the Argonne, it became necessary to establish another machine-gun center in the latter area, as Void had to care for its own sector with additional burdens in the Verdun sector.

To meet the requirements of the first phase of the battle of the Argonne, I established from the machine gun center at

Void a forward echelon or corps dump for each of the three corps; one at Nixeville; one at Brabant en Argonne and the third at Les Islettes. These echelons were moved forward as the battle progressed.

A temporary center located at Vaubecourt for the Château-Thierry offensive was later transferred to Parois and was enlarged to become the machine-gun center, 1st Army. The center at Void was then transferred to the 2d Army. These two centers were later combined and moved to Germany, where, with the cessation of hostilities, they finally became a part of the Ordnance Depot, 3rd Army.

With a scarcity of automatic arms and accessory equipment, and with a majority of divisions receiving their automatic arms in the army zone and all automatic arm repair centered in this zone, it was natural that all salvaged material of this type should be directed to the Army machine-gun and small-arms centers. Rifle salvage, except for immediate needs, was sent to rear shops.

We had not a single item of machine-gun fire-control equipment for issue when we declared war. I had several years previously, when in command of the machine guns of the 10th Cavalry, developed the greater part of the technique of machine gun fire, including indirect fire, and had several instruments and devices personally owned; these formed the basis of fire-control equipment, the angle of site instrument being still in use. I designed several other devices, including the electric night-firing box. We completed the War with the best machine gun fire-control equipment in Europe.

Hot machine guns, ice-cold machine guns in freezing temperatures, enemy gas on machine-gun mechanisms, etc., demanded special study and the supply of simple remedies. It was both interesting and amusing when we found one article that would solve two of these problems and partly solve the third. That article was the golf bag! We bought thousands of golf bags in England.

With the golf bags at hand, they could be drawn over the guns during an enemy gas attack and thus prevent the choking of the mechanism, the gunners firing through the bags. When changing position, the hot guns could be carried in the bags. And in winter, especially in trench warfare, where the guns were fired infrequently, the bags would assist in preventing the freezing of the water solution in machine-gun water jackets. For this latter problem, an antifreeze solution was also issued, and a blanket was also frequently wrapped around the water jackets. The issue of lubricating oils of suitable grades was another problem of importance.

The machine gunners themselves solved one problem and that one was,—the carrying of spare parts and the preventing of rust. The spare-parts boxes were thrown away, the parts being carried in a long woolen sock that had absorbed considerable oil. I utilized the golf bag idea and the woolen sock in the design of the present machine gun pack equipment by providing a bag cover for the guns, and canvas bags for the parts carried in a spare part *roll*.

THE Meuse-Argonne offensive was one of the world's greatest battles and the one in which the greatest use was made of automatic arms. No other army in the history of the world ever had so many types of automatic and other small arms. To send a modern army thus equipped into battle would have been looked upon, before this war, as folly. A condition that had to be overcome was met, and that it was met thoroughly is attested by reports received from each division. Losses from automatic rifles alone often amounted to 50 per cent after a few days of battle. American types of small arms were superior to those of any army in Europe, and American technique of machine gun fire was also superior. The machine-gun and small-arm centers were instrumental in solving the problems of automatic small arms supply, technical instruction and maintenance for the American armies.

A SEA BEACH RANGE FOR TESTING DISPERSION OF MACHINE GUN FIRE

First Stages of the Mexican War

Initial Operations of the Army in 1846

By Martin L. Crimmins*

IN the autumn of 1845, our entire Regular Army, with the exception of one regiment of dragoons, three regiments of infantry and a few artillery garrisons along the coast, was assembled at Corpus Christi, Texas. It formed the "Army of Occupation" under Brevet Brigadier General Zachary Taylor, Colonel of the 6th U. S. Infantry.[1]

The occupation of Texas territory before that state's formal admission to the Union, which did not occur until December 29, 1845, was in line with the policy of President Polk to whom "possession was nine points of the law." The territory in dispute, having been occupied by the United States, any movement into it by Mexican troops could be construed as an invasion of American soil and an attack placing him on the defensive. General Taylor was an experienced soldier. He was about sixty-two years old and, for forty years, had seen hard service. In appearance and deportment, he lived up to the name of "Rough and Ready." [2]

The Army of Occupation was composed of the 2nd U. S. Dragoons, the 3rd, 4th, 5th, 7th and 8th Regiments of Infantry, and the 1st, 2nd, 3rd and 4th Regiments of Artillery [3] with a total strength of about 4,000 men. The weakest regiment had but 169, rank and file; the strongest but 375.[4] The troops were encamped along the sand spit below the town, a place which Lieut. R. H. Wilson, Adjutant of the 8th Infantry, described as "the most murderous, thieving, gambling, cut-throat, God-forsaken hole in the 'Lone Star State'." [5] Here they remained from August of 1845 to March of the following year.

ON March 8, 1846, Taylor started for the Rio Grande, a distance of one hundred and seventy-four miles. The advance guard marched away from Corpus Christi on the eighth; but the rear guard not until the eleventh.[6] The line of march extended through a country where the fear of Indians and the shortage of water had kept people from settling. The only water courses were at Agua Dulce, San Fernandez, Santa Gertrudas and Arroya Colorado, the latter being salty. From the last-mentioned point to the Rio Grande, was forty-five miles with no water to be obtained other than from one stagnant pool. The bed of the Colorado was two hundred and fifty feet wide at the crossing and was boggy in places, as were the beds of several small lakes crossed by the road. After heavy rains these lakes were probably impassable for wagons. With these exceptions, however, the road seems to have been good. From the Neuces to the Rio Grande, the country was mostly prairie with small patches of mesquite, scrub and post oak. The land was covered with luxuriant curly mesquite grass, making it an ideal range for stock. Great herds of wild cattle, horses and deer were found in these rich prairies. The only settlements were near Corpus Christi and on the Rio Grande.[7]

On March 25th, after a march of eighteen days, the column reached a point where a branch road led eastward to Point Isabel, then in possession of the Mexicans. Taylor halted and, directing General Worth to establish camp with the Infantry brigades and the Artillery, he marched on Point Isabel with the 2nd Dragoons and two batteries. Worth went into camp at Palo Alto.[8]

As far back as February 4, 1845,[9] General Taylor had picked Point Isabel as a possible base of supplies.[10] By having a base at that point he would be one hundred and fifty miles nearer than at Corpus Christi, to the place where he expected to cross the Rio Grande into Mexico. Point Isabel was about thirteen miles from the mouth of the Rio Grande on a land-locked harbor of the Laguna Madre. Padre Island and Brazos Island were on the ocean side protecting the harbor, and there was a channel between the two islands with about eight feet of water at high tide. Point Isabel had a Mexican garrison of two hundred men under General Garcia. Don Rodriquez was in charge of the customs house. When they saw the Americans approaching the Mexicans set fire to the customs house [11] and three or four smaller buildings and escaped to Matamoras via the Boca Chica, a small channel at the southern end of Brazos Island.

TWO hours before Taylor reached Point Isabel, the brigs-of-war, Porpoise and Lawrence and the cutter Woodbury arrived at the outer mouth of the harbor.[12] The American troops saved what they could from the fire. Major John Monroe was put in command of the base with a garrison of two companies of artillery.[13] The defenses were planned by Major John Sanders of the Engineer Corps [14] and were begun at once.

General Taylor then withdrew and marched with the rest of his command to a point on the Rio Grande opposite Matamoras, arriving March 28th.[15] Here the troops started immediately on the construction of a fort, a six-bastioned field work,[16] which they named Fort Taylor in honor of their commander. On April 19th, at Taylor's request, the Navy closed the mouth of the Rio Grande. Matamoras was occupied, at that time, by a Mexican force of about 2,200 men under command of General Mejia. His troops consisted of one regiment of cavalry, three regiments of infantry, a battalion of the National Guard of Matamoras and twenty pieces of field artillery served by one company.

When the Americans appeared he ordered the "Generalia" sounded, and the troops went into a position of defense at Fort Parades and other redoubts nearby. The Mexican people gathered on the roofs of houses in Matamoras to watch the sight. At 2 P. M. a white flag was seen on the American side of the river, and Mejia sent General Diaz de la Vega across for a parley. When the general arrived on the north bank the Americans ran up their own flag to indicate their right to be there. This so incensed the Mexican soldiers that they wanted to fight right away and had to be restrained by their officers. Nothing of importance resulted from the parley. The Americans continued to construct their redoubts, and the Mexicans did nothing in an effort to stop them.

*Colonel, U. S. Army, Retired.

About April first the Mexicans were reinforced by a battalion of Marines from Tampico, the 6th Infantry and a battalion of the "Guardia Costa." This gave them a total of about three thousand men. But they were short of provisions and had barely enough ammunition when the Americans blockaded the mouth of the river. They were then so short of food that flour sold for forty dollars a barrel!

On April 11th General Ampudia arrived with a regiment of cavalry. His division came in on the 14th under Brevet General Torrejon who brought with him 2,200 men and six pieces of artillery. His troops were composed of active battalions from Mexico, Puebla and Morelia, and the 8th Cavalry.

IN the meantime, at Point Isabel, the Commanding Officer of the base, Major Monroe, became aware of the enemy's approach. On the night of April 27th he was so sure of being attacked that he asked for assistance from the naval forces.[24] He received a reinforcement of some five hundred men. A detachment of Texas Rangers under Captain Walker also arrived, after which Monroe felt strong enough to resist any attack. Walker was sent out, however, to investigate the movements of the enemy. He ran into an overwhelming force of Mexicans[25] which he estimated at 1,500, and, after a hurried retreat, got back to Point Isabel with but two of his men. Seven more came in later. A detachment of Texas

Courtesy U. S. Navy Library

THE UNITED STATES SQUADRON LANDING ITS SEAMEN AND MARINES AT POINT ISABEL, MAY 8, 1846.

General Ampudia was planning to cross the Rio Grande and cut the Americans off from their base when, on the night of April 15th, he was relieved by General Arrista. Arrista assembled all the cavalry and two companies of light infantry, under General Torrejon, at a point called Solincevo nine miles up the river; and, on the 24th, they crossed at Palangana.[17] Another force of one thousand men crossed at Longereno, ten miles east of Matamoras.[18]

The Americans on the north side of the river continued their work of fortification. There were constant rumors of the strength of the Mexicans in Matamoras, some going as high as fifteen thousand,[19] or about five times the strength of the American army. It is doubtful, however, if the Mexicans ever had more than 5,200 men.[20] There were reports, also, that the enemy was about to cross the Rio Grande and drive Taylor's little force back from the river.

On April 24th word came that the Mexicans had crossed at Palangana; and Capt. Seth B. Thornton was sent with his squadron of the 2nd Dragoons to investigate the report. He rode twenty-six miles up the river and into an ambush,[21] losing one officer and ten men killed, and three officers and some forty-two men captured, six of whom were wounded. Capt. Croghan Ker, with another squadron, was sent eastward to watch the crossings of the lower Rio Grande and report any signs of the enemy.[22] He reported that he had seen none, although he had ridden as far as Burrita, about twenty miles. The Rio Grande makes a deep bend to the south at Longoreno,[23] which probably accounts for Ker's failure to detect the Mexicans' crossing.

Rangers sent to watch the river crossing at Longoreno was surprised during the night with a loss of ten men, five killed and five missing, and a wagon train with supplies for Fort Taylor met the enemy and had to return to Point Isabel. Captain Walker then volunteered to ride to Taylor's camp with information of the enemy's movements; and, on the night of April 29th, he succeeded in reaching General Taylor with a message from Monroe stating that the Mexicans were about to attack Point Isabel. On May 1st, Taylor marched back towards his base with his entire command less the 7th Infantry and two batteries which he left under command of Maj. Jacob C. Brown to defend Fort Taylor.[26] Before leaving he directed Major Brown, in case of grave danger, to signal by firing his 18-pounders at regular intervals as these heavy guns could be heard at Point Isabel thirty miles away.

On his way to his base, Taylor seems to have marched close by the Mexican force that had crossed at Longoreno without suspecting its presence,[27] although he now had Walker's efficient Texas Rangers whom he might have used as scouts. It is hard to understand such a lack of security and information in the command of so experienced a soldier. The enemy interpreted Taylor's withdrawal as a shameful retreat inspired by fear;[28] the "Boletin de la Division del Norte" gleefully proclaiming it as such to the army, and promptly decided to attack the American works.

After General Taylor's departure, the troops under Major Brown continued to prepare for a Mexican attack which was finally launched on May 3rd, and defended themselves suc-

cessfully until the 9th when the enemy withdrew. During that time they repulsed a vigorous assault and sustained a bombardment of some 1,500 shot or shells.[29] On the fifth, at dawn, large bodies of the enemy were seen approaching from the north, or rear of Fort Taylor. By 5 P. M. they had a battery in position which brought the fort under two fires. A cross fire was opened which lasted an hour.[30] The following day, May 6th, Major Brown was mortally wounded, his right leg being shot off. He remained calm, however, cautioning his men to remain at their post of duty.[36] On the seventh he ordered the garrison to conserve its ammunition and reply to the fire of the enemy only when the latter were within eighty yards. On May 9th Major Brown died,[32] but he had done his duty and the fort remained in American possession.

General Taylor reached Point Isabel after a forced march, on May 2nd.[33] Two days later he could hear the Mexican cannon exchanging shots with Fort Taylor.[34] His troops stood to arms ready and expecting to march to the relief of their comrades, but Taylor made no move, for the time being, to retrace his steps to the Rio Grande. Instead he ordered Captain May, with a squadron of the 2nd Dragoons, and Captain Walker with ten of his Texas Rangers, to proceed to within six miles of the fort and reconnoiter between the road and the river. The detachment was to halt under cover of the thick chaparral, and if there were no firing at the fort Walker was to get in touch with Major Brown and find out the position and strength of the enemy. May was to examine the country towards San Colorado, but, under no circumstances, to bring on an engagement.[35] Captain May found the enemy occupying the old American camp at Palo Alto.[36] Darkness was coming on and, as there was no firing at or from Fort Taylor, he sent Walker with six Texas Rangers to communicate with Major Brown. Walker reached Fort Taylor at about 2 A. M. and, after getting the desired information, started back. Arriving at the place where he had left Captain May, he found that the Dragoons were gone so he returned to Fort Taylor.

Captain May had returned to Point Isabel, the enemy had discovered his position and he was under orders not to bring on an engagement. When some twelve miles from the base he ran into about 150 Mexican Lancers who were trying to cut him off.[37] His horses were jaded but he charged boldly and followed the enemy for three miles. His tired horses were unable to overtake the Mexicans so he abandoned the chase and proceeded to Point Isabel. The next night Walker succeeded in getting through the Mexican lines and brought the good news that Major Brown was confident he could hold his own without assistance.[38]

TAYLOR remained at Point Isabel until May 7th. His action in withdrawing to his base and remaining there long enough to permit the enemy to cross to the north side of the Rio Grande showed good generalship and excellent strategy. It placed the Mexicans with the river behind them, an obstacle to reinforcement or retreat, and the garrison of Fort Taylor in their rear, forcing them to divide their forces. Politically, it eliminated all doubt as to Mexico's being the aggressor.

On the evening of May 7th Taylor left Point Isabel with 3,300 men and 250 wagons laden with stores.[39] After marching seven miles he bivouacked for the night. On the morning of the eighth the troops again took up the march. At noon the enemy was reported, in force, two miles to the front. The men stopped to drink from some pools and then pushed on. At about 2 P. M., when still a mile from the enemy, who appeared to be superior in numbers, the Americans deployed for action, in order from right to left as follows:

The 5th Infantry, (Lt. Col. James B. McIntosh); Captain Samuel Ringgold's Battery; the 2nd Artillery, (Captain L. N. Morris); the 3rd and 4th Infantry Regiments, (Major C. W. Allen); two 18-pounders of the 3rd Artillery, (Lieut. William Hunter Churchill); a battalion of artillery serving as infantry, (Lt. Col. Thomas Childs); the 8th Infantry, (Capt. C. W. Montgomery); and Capt. James Duncan's battery of the 2nd Artillery covered by a squadron of Col. David Twiggs' 2nd Dragoons.[40]

The Mexican line extended beyond the American flanks and was reported to be three times as strong. The cannonade began from the enemy's right and was followed, at intervals, all along his line. The Mexican projectiles pierced the American line. But the troops stood fast in spite of the demoralizing effect of fire that could not be returned; for their only wish was to approach to within musket range of the enemy. Ringgold's and Duncan's batteries advanced, however, and replied with deadly effect. The 18-pounder appeared to be causing confusion in the enemy's ranks.

Taylor, seeing a large force of Mexican cavalry moving around his right flank, ordered the 5th Infantry to the right front to stop it. Colonel McIntosh moved his regiment a quarter of a mile and formed a square just in time to meet a charge of the enemy. The Mexicans, some 800 strong, rode down on the square until within one hundred feet, then fired and charged; but not a man of the Fifth Infantry waivered. At this point, the fire of the rear rank was delivered with drill-like precision and deadly effect. Walker was on the right with twenty of his Texas Rangers, and their fire was cool and deadly. The enemy broke to the left and retreated. While the Mexicans were charging, Lieut. Randolph Ridgeley brought two pieces of Ringgold's battery up in rear of the 5th Infantry. As he was unable to get around the flanks because of the nature of the ground, the Infantry made a gap, moving to right and left, and the guns soon routed the enemy with grape and canister.[41]

The artillery continued to fire until about 7 P. M. The prairie, in the meantime, had caught fire and brilliantly illuminated the front.[42] Some twenty pieces of artillery thundered from right to left; the men cheered and restless horses tramped. And so ended the battle of Palo Alto, May 8, 1846.

THAT night the American Army bivouacked on the battlefield. Its casualties had been slight, only five killed and forty-three wounded;[43] but brave Samuel Ringgold and Capt. John Page of the 8th Infantry had both received mortal wounds.[44] The Mexicans were reported to have lost five hundred killed and wounded.

At dawn the next morning, May 9th, the Mexicans withdrew for a distance of three miles to what they considered a strong position in the Reseca Guerrero, known in American histories as the Reseca de la Palma.[45] It was a narrow swale about six feet deep and fifty feet wide, extending in a wide arc for a mile east, and a similar distance west of the Palo Alto—Matamoras road, with its concave side facing north towards Palo Alto.[46] A former channel of the Rio Grande, it was muddy in spots with shallow pools both right and left of the road. The space between the water and the banks of

AT THE BATTLE OF RESECA DE LA PALMA, MAY 9, 1846 *U. S. Signal Corps Photo*

General Zachary Taylor giving the order to Captain May to charge the Mexican battery.

the reseca was covered with chaparral. General Arista posted three or four guns east, and others at suitable intervals west of the road, with two more hidden with branches in his rear on the south bank of the reseca. The infantry were placed in two wings separated by the road, that on the right (east) being the stronger. The position was protected by the woods from effective artillery fire; and the north bank of the reseca formed a natural breastwork. But Arista's main batteries could fire only straight down the road, for there were troops in front of the main position on each side of the highway.[47] The Mexican troops, apparently, had not eaten for about twenty-four hours and were not in as good fighting condition as the Americans.[48]

The Americans deployed for battle. On the right (west) of the road, the 3rd Infantry led the attack supported by the 4th Infantry.[49] Early in the fight the 8th Infantry, on account of change of front, found itself in rear and was held in reserve. The 4th Infantry kept very good order going through the chaparral, charged and captured the camp of General Ampudia, with all his official correspondence, a large amount of ammunition, four hundred mules and other army equipage.[50]

Some Mexican guns were beyond range of the American artillery, and were doing considerable damage; so General Taylor ordered Capt. Charles A. May, with the 2nd Dragoons, to charge them.[51] May did so and captured not only seven of the enemy's guns, but the general commanding them as well. But he was unable to hold them without help of the Infantry, as he had lost so many men in making the capture. This he reported to General Taylor who, turning to Maj. William C. Belknap, commanding the Eighth Infantry, gave the following memorable order: "Charge in there Colonel Belknap, and take those guns and keep them."[52] The 8th Infantry deployed to the left of the road and, supported by part of the 5th Infantry, charged into the ravine and up on the other side against the Lapadores and Tampico Guards, two of the best regiments in the Mexican Army. A hand-to-hand fight took place; most of the Mexicans were killed or wounded, and all seven guns were retaken. The 8th Infantry lost, in this engagement, one officer and nine men killed, and seven officers and twenty-six men wounded.

The Mexican Army was driven back across the Rio Grande, and many were killed or drowned.[53] The total American loss in the two engagements was reported as one hundred and seventy killed and wounded. The Mexican loss was estimated at one thousand.[54] The Americans captured fourteen officers, eight guns and a large amount of property. General Taylor had no means of crossing the river, so he was unable to pursue the Mexicans.

On May 17th, the name of Fort Taylor was officially changed to "Fort Brown" in memory of Maj. Jacob C. Brown who had given his life so valiantly in its defense.

General Taylor wrote: "Hostilities may now be considered as commenced." President Polk, as soon as word came that the Mexicans had crossed the Rio Grande and that American soldiers had been killed, had announced to the Congress and to the world, "Mexico has passed the boundary of the United States and has invaded our territory and shed American blood upon the American soil." On the 13th of May, the Congress proclaimed, "That war existed by the act of Mexico."[55]

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Effective Bombing

The Importance of Aerial Sighting Mechanisms

By Erhardt C. Koerper*

DURING all the ages man has been, and still is, constantly striving to better protect and arm himself against his enemies. Winged man above the earth, and his resultant advantageous position over the ground man, has always been a subject of great speculation. The Greeks in their ancient mythology gave greater power to their gods by creating them with wings to annihilate heights and distances.

It is interesting to note that one of the earlier papers on this subject was written in 1640 by Francesco Lano, a Dominican friar of Italy, who wrote a thesis on the use of "aviation" for attack on hostile forts and castles. While Leonardo da Vinci (1452-1519) was perhaps the first individual to approach the problem of flight in an intelligent manner, it was not until long thereafter that Lilienthal (1848-1896) succeeded in gliding into space. Langley (1834-1906) developed the air foil theory and was first to demonstrate the practibility of mechanical flight with his tiny experimental steam-driven airplane. Then came the Wright Brothers, who for the first time in history (1903) accomplished sustained flight with a heavier-than-air power-driven device. The relative rapid change and development in aviation since then has added a protecting arm to the fighting forces of a nation, proving itself a threat to all other branches both on land and sea.

Supremacy of the air has in turn developed entirely new tactics and directed vital attention to bombing, which is absolutely necessary to a country's aërial offensive tactics. The problem of quickly and effectively directing bombs against a target is of the utmost importance in the successful pursuit of any major campaign. This has been fully recognized by military authorities and forcibly demonstrated by the results obtained by the U. S. Air Corps in 1921 and 1923. Since then many tests in this and other countries have stressed the vulnerability of all targets to aërial attack. Aërial bombing is perhaps the most potential threat of the flying forces, and there is no question but that effective bombing, especially at increasingly higher altitudes, depends principally on an accurate, dependable and simple bomb sight.

Courtesy G. M. Bellanca

A Bimotored Bomber.
Bellanca bombing plane powered by two Wright Cyclone engines totalling 1430 horsepower.

The difficulties of artillery fire control are well recognized. Yet its problems are simple when compared with the complexities of aërial bombing. Imagine, if you will, trying to hit a target, either fixed or moving, with a gun having a fixed elevation, azimuth and propelling charge. To accomplish the desired result the gun must be moved over the terrain to the one spot that will give the direct hit, under the complexities of aërial navigation. Travelling at high speeds, tolerances of tenths of seconds may spell the success or failure of the mission.

BOMBING, to be effective, must be possible from any direction regardless of the wind; in order to avoid the necessity of twice passing over the same antiaircraft operations. For this reason a new point of release "R," must be determined for each bombing or group of bombs to be dropped.

It is true that because bombs carry a higher percentage of explosives than projectiles, their effect will be greater. This in turn means that the accuracy of bombing for the same destructive effect need not be as great, though a direct hit by bomb is vastly more effective than that of a projectile of comparable weight. Nevertheless this very valuable increased increment of accuracy can only be obtained by the use of a bomb sight, that takes into consideration the kinematic or personal factors as well as those necessary for the mathematical solution of the problem.

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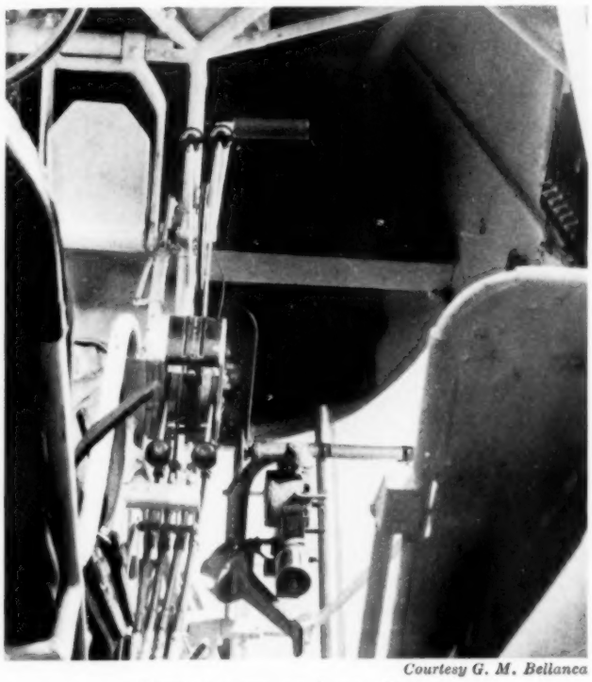
Operations requiring such precision and control of rapidly varying factors require team work of the highest order so that their actions may be coördinated to direct airplanes with unerring accuracy over that mysterious spot known in bombing parlance as "release point." As a team, the coördination of the bombardier and the pilot under all conditions spells the success of their mission. The bombing teams for the national Air Corps matches are prepared by months of training.



Courtesy G. M. Bellanca

INSTALLATION OF BOMB SIGHT.

The D4 bomb sight installed in front cockpit of Bellanca bimotored bomber. (Looking down and forward in bombing bay.)

A successful bomb sight must account for and make corrections for numerous variables, some of which are known or can be determined, while others are often impossible to determine accurately. The latter includes a number of personal or operation errors, the elimination of which can only be accomplished or minimized in the original design of the instrument that operates under those conditions. This refers in particular to kinematic design.

Some authorities question if accuracy, dependability and simplicity can be included in a single design. It is true that any design is a compromise. The best design, however, is the one that utilizes the natural advantages of both man and material and makes the optimum compromise with the most important factors.

Bomb sights are of either the timing or synchronizing type and are stabilized either by the pendulum or the gyroscopic method. The greatest advantage of gyroscopic stabilization is the apparent stability of the optical reticule. However, precession and other disturbing factors which are too complex to be dealt with in this article, have the strong tendency to draw, slowly and unnoticeably the bomb sight off the verticle. This tendency must be checked by the old fashioned bubble level, which like the pendulum, is subject to disturbances by acceleration and centrifugal forces. The application of pendulum stabilization is more advantageously used for modern bombing planes because the stability of the latter has been greatly increased in the last few years. It is unavoidably true that bombing an objective with aërial and terrestrial opposition will cause irregularities in flight, the same effect of flight path difference will effect the plane regardless of the type of stabilization being used. In flight the vibration of the plane eliminates static friction of the air dash pot and provides quite satisfactory stabilization.

Equipment for emergency and field use must be designed with much greater care and thought than that for laboratory use. The personal factor and necessity of kinematic design; that is, a careful consideration of all personal factors to adapt them to the actual conditions of operation so that its use will be natural, logical and in some cases almost automatic, is most important. This phase of design is sadly neglected even for instruments in every-day use. A bomb sight, or any instrument regardless of its inherent accuracy, loses its value if adjustment and settings are difficult or easily disturbed. This essential simplicity and ruggedness is reflected in decreased maintenance and continued accuracy, which are two very important features for field operation. Simplicity and ease of operation are paramount. The problems of the procuring agency can also be greatly simplified through these characteristics.

All needless calculations and settings must be eliminated and the number of scales must be reduced to a minimum. The necessity of long error-introducing calculations for altitude and atmospheric conditions have been eliminated by the use of "indicated air speed" instead of actual air speed. The necessity of determining drift by a separate device is eliminated by the ingenious drift corrector and pilot director control, while the complex variable of trail is corrected for air speed, altitude and terminal velocity of the respective groups of bombs. In some cases extra scales have been eliminated by including the corrections in the calculations of another scale.

It is quite apparent that small weight, small size and the ability to rapidly install a bomb sight in any plane is very important. Because of the number of different types of planes in use, rapid interchangeability is almost imperative.

The direction of the bombing plane is accomplished by means of a pilot-directing device. Speaking tubes and interphone sets are most common for bombing as normally practiced, and there is a certain psychological advantage in the use of an oral communicating system. Much more of a personal factor, however, is present in their use, which to a certain extent should be avoided. This is particularly true if the pilot and bombardier are to be selected at random and sent on missions with a minimum practice with each other.

The Estoppey D-4a bomb sight can be used at altitudes 2,000 to 20,000 feet (1000m—6000m) for bombing against either fixed or moving targets in any wind regardless of direction. The sight is now manufactured in either metric or English units and as here described, is improved in a number of ways over the original D-4. It retains, however, all the inherent advantages of the original sight and includes among others the following additional features: a. the extension of terminal velocity range; b. the extension of the air-speed scales for trail correction, and c. greater ease in manipulating the drift correction and pilot direction.

This bomb sight is enclosed in a stabilized housing of aluminum alloy and is placed directly on the mounting post

and bracket as illustrated. It can be installed either in the front cockpit or within the tail fuselage. A floor opening of sufficient size should be provided to give a clearance for the maximum pickup angle and drift angle. The bomb-releasing mechanism and the bomb sight should be conveniently close together; the bomb release preferably at the right hand side of the bombardier. The plane must, of course, be in a flying position for the proper alignment of the sight. After the bracket is set, the sight itself can be quickly mounted or dismounted, the entire operation being easily performed in 20 seconds. The damping of the sight, accomplished by two air dash pots at right angles to each other, allows stabilization at any deviation of the plane up to 6° from the vertical axis. A hinged lug on the main support arm is provided to engage with a stud on the housing to prevent relative motion when the sight is dismounted.

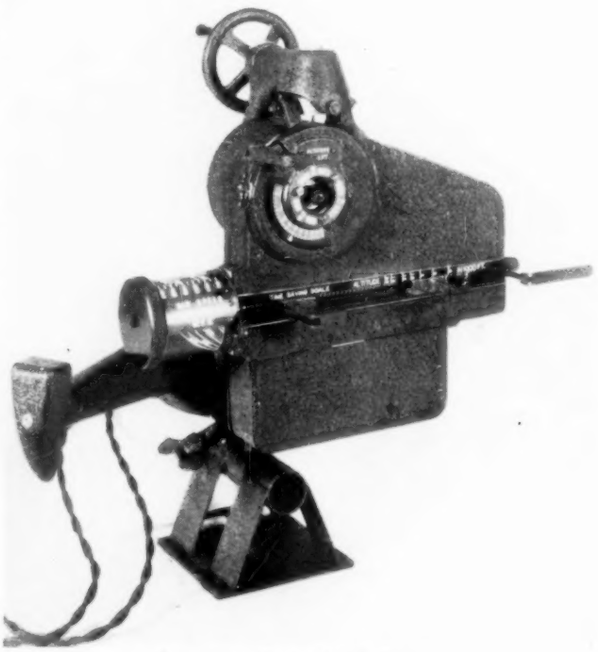
For convenience in description, the bombing mechanism can be considered to comprise the following units: 1. Scales or dials for: (a) indicated air speeds and terminal velocities, (b) altitude and terminal velocity, (c) linear altitude scale for pickup angle, and (d) personal error; 2. sighting elements; 3. timing mechanism; 4. following device; 5. pilot director control.

The indicated air speed can be set to any value from 80 to 180 m.p.h. (130 to 300 kilometers per hour), and need not be corrected for altitude. An indicated air speed of 180 m.p.h. represents approximately 250 m.p.h. at 20,000 feet altitude and in the metric system calibration an indicated air speed of 300 kilometers per hour represents approximately 410 kilometers per hour at 6000 meters. Components of drift and side wind are automatically corrected for by the lateral motion of the upper sighting wire. The altitude is set off on the linear "time-saving scale" and on the altitude pointer knob on the proper terminal velocity altitude scale. Because of the wide range between the terminal velocities of 800 feet per second and 1600 feet per second, (240 meters per sec.—480 meters per sec.), it has been found desirable to utilize three altitude scales for respective groups of terminal velocities, thereby increasing the accuracy of the sight without necessitating corrections or field calculations. The personal time lag scale represents the accumulation of the personal errors of the bombardier plus the mechanical time lag in the release of the bomb. These errors must, of course, be determined by actual experiment.

The sighting elements consist of a front and rear bottom sighting bracket with cross wires which travel along the lower sighting wire, and the upper sighting bracket which moves laterally to compensate for cross winds. The bottom sighting brackets and nuts are connected to their respective screws of different pitch which are integral on the same axis. The timing angle is determined by the travel of the forward bracket while the rear bracket is automatically set accordingly.

The timing mechanism is a watch specially designed for the purposes and built to withstand the abuses it normally encounters. This unit is the "heart" of the sight and must be sturdy to function accurately under all conditions. The timing operation and the travels of the altitude pointer are automatically started when the "following operation" is started with the main control wheel. When the main control wheel is turned backwards, the watch mechanism is automatically rewound, simultaneously moving the lower sighting brackets back to their initial position.

The range-following device is simple in operation. When the front lower sighting bracket, which has been set at the predetermined bombing altitude, intersects with the scale, the conveniently placed main control wheel is started and the target is followed by means of it. The watch movement is automatically and simultaneously released with the start of the "following operation." The altitude pointer then follows the circumference of the altitude scale and finally appears at the opening under the upper sighting wire. At this moment



Estoppey D4A Bomb Sight.
The improved instrument of compact, light and effective design.

the cranking is stopped. In the meantime the rear sighting wire has moved up in proportion to the angle protracted during the timing operation. All action is then suspended till the target intersects the rear sighting wire at which time the bomb is released.

The pilot director and pilot director control are conveniently arranged and located. A standard 12-volt instrument as illustrated, with zero center reading and located in front of the pilot, is electrically connected from the battery by cable and keyed plug to the pilot director control case located in the end of the drift compensating control handle. The bombardier lines up the sighting wire on the target by the drift compensating handle and indicates at the same time the desired action to the pilot by merely twisting the pilot director control to the right or to the left to bring the pilot onto the desired course. Heavy wipe contacts on a potentiometer winding in the control housing give a selective and sure response of the pilot director proportional to the twist of the pilot director control handle. When not in use, the pilot director needle returns to zero, indicating to the pilot that he is on the desired course. As before mentioned, the further use of the interphone greatly helps the piloting operation.

From this brief discussion it is apparent that there is a definite need for a light, compact, accurate bomb sight for the successful execution of aërial bombardment missions.

ARMY ORDNANCE

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Month by Month

IN the life of every great soldier there are milestones which attest in no uncertain terms the causes of his success or greatness. The rule applies to Cyrus and Caesar as definitely as it does to Pershing and Foch. It applies in a very marked way to the officer who for the past four years has directed the Army of the United States, Gen. Douglas MacArthur. Of the many deserved tributes in his exceptional career General MacArthur's retention as Chief of Staff of the Army for an indefinite period is a signal tribute to his ability as soldier and administrator. When his four-year detail as Chief of Staff expired November 20, 1934, his term was extended by special order of the President until December 15th. The retention in turn was extended at least for the present session of Congress. This is an honor not before accorded any officer; it bespeaks the approbation in which his military service is held throughout the land. There is assurance in this step that the administration frankly acknowledges that the pressing military problems of the day demand an experienced leader; there is much cause for gratification in the knowledge that no rule of procedure is too sacred for compromise when the exigencies of the day demand action.

GENERAL MACARTHUR'S LEADERSHIP

General MacArthur has proved to the country the soundness of his philosophy and the caliber of his administrative ability during every stage of his military career. It is not our purpose here to recount the details of that service in their entirety, much less to narrate the factors of his success as Chief of Staff during the past four years. His leadership is firmly imprinted on the Army of the United States as reflected in the state of its morale, its readiness and its sanity. His tenure as Chief of Staff has lasted during a period of economic depression when the military establishment has been and still is the target of crackbrained malcontents—who know full well that the effectiveness of the United States Army is as much the bulwark of constituted authority in the land as it is the backbone of defense against aggression from without.

General MacArthur has led the way in every constructive military advancement of the past four years. Devotion to duty is to be expected of an Army officer; the Chief of Staff gives a living example of it for the present and future. His policies and he personally have withstood every sort of attack, planned or surprise. When reductions in strength of the officer contingent were advocated repeatedly by incompetent judges he held his ground. When inroads were attempted through the medium of reduced appropriations and budgetary devices he gave no quarter. When National Guard, Reserve Officer training and Citizens Military Training Camps were threatened with curtailment he spoke the truth fearlessly. Moreover he has led the directive in the expression of doctrine on the changing concepts of warfare and the place of a modern army therein. He has reorganized our military form on the basis of four armies and the general headquarters air forces; he has developed tactically, technically and administratively a coördinated and efficient arm of the national defense.

Little wonder then that the Secretary of War, George H. Dern, welcomed the extension of his tour as Chief of Staff confident in the hope that "his experience, counsel and adherence to high principles will be of inestimable value to the War Department." As General Pershing has said of General MacArthur, "He is progressive without being radical. His courageous presentation to high authority of his sound views and recommendations has been admirable. By wise administration of his office he has won the entire confidence of the Army and the country." Observers have shared these high estimates for many years. ARMY ORDNANCE joins with good citizens everywhere its feelings of high regard for a man of principle and fidelity under whose direction the Army will remain during the immediate period when crazy ideas about national defense are all too prevalent. General MacArthur's retention as Chief of Staff is assurance that the fundamentals of national security as effected by our military arm are themselves secure.

ARMY ORDNANCE is privileged in this issue to publish several articles on American military history. These will be reprinted in a special supplement, the first of its kind, for gratituitous distribution to the members of the American Military History Foundation. The supplement will also contain a foreword by Col. A. L. Conger, President of the Foundation. This coöperative effort on the part of ARMY ORDNANCE is entered upon for the double purpose first to stimulate much needed interest in the general subject of our military history and, secondly, to assist the Foundation in this beginning of what all hope will eventually flower into the bona fide annals or proceedings of that organization. Until such time as the Foundation is able to embark upon a venture of this sort ARMY ORDNANCE will be pleased to coöperate from time to time by the issuance of these supplements. All members of the Army Ordnance Association will, of course, be welcome to copies of the reprinted supplement now and in future.

MILITARY HISTORY FOUNDATION

The American Military History Foundation was established several years ago through the zeal of a group of our military

historians who realized that the preservation and elaboration of our military annals is a much neglected phase of our national life. This group, guided and nurtured by the late Col. Charles E. T. Lull, Executive Secretary of the Foundation, has assembled together a body of several hundred students of our military history as the nucleus of the Foundation. The untimely death of Colonel Lull last November, in the midst of plans which were about to bring the Foundation into more general public notice, has left in the determination of his associates a greater purpose to carry on the projects which he had begun. Among these projects was the publication of a military history supplement in coöperation with Army Ordnance which now is about to materialize. The valuable library which Colonel Lull had accumulated has been presented to the Foundation as a tribute to his memory. So also will this original supplement and its eventual evolution into a first-class review of our military history bear his mark of pioneering achievement.

Army Ordnance hopes through this means to emphasize two main principles which it believes to be vital to national policy. The first is that the all-important facts of our national history have a definite relationship and dependence upon our military history, and the second that the lessons of our experience will not ever serve as a guide for the future unless they are at least readily available for study. Should this gratuitous help to the Foundation enable these principles to succeed we feel confident that all members of the Association will approve the undertaking as both appropriate and timely.

So many contradictory statements on the question of armament are put forward these days by alleged peace advocates that it is extremely difficult to keep up with them. Armament makers here and abroad are held up to the scorn of unwitting pacifists to an extent and with an insidiousness never before equaled. By the time one grotesque charge is made another follows so quickly that there is not time—assuming there were an inclination—to grant the accused his day in court.

Damned If They Do—
Damned If They Don't

Amidst all the confusion of invective and non-factual agitation, none strikes us as being more asinine than reports eminating from Geneva regarding the latest move proposed in the Bolivia-Paraguay dispute over the Gran Chaco. According to Mr. Clarence E. Streit in his dispatch to the *New York Times* of January 16, 1935, the League proposes a punitive step to curb Paraguay. When the League of Nations Assembly's Chaco Committee recommended that all League members lighten their arms embargo insofar as it applies to Bolivia and strengthen it insofar as it applies to Paraguay, we are not concerned with the reasons on which this decision is based. All thoughtful readers should be very much concerned with the principle here involved particularly as it relates to the "nefarious" armament makers.

According to Mr. Streit, the Committee concludes its report "by recommending definitely, although, not in these words, *that League members now permit their armament companies to sell freely to Bolivia* (italics ours) while taking all possible measures to render the embargo more efficacious insofar as they intend to maintain it—which is to say against Paraguay." According to the *Times* dispatch the Committee's recommendation "specifies that the Paraguayan embargo should be strengthened notably, first, as regards transit, export and re-export, and, second, that League members should grant licenses to ship arms only to governments and governmental agents."

Journalists who seem determined to excite public opinion had best not mention this recommendation when dwelling upon "the munitions racket." Just a few months ago unthinking people were jarred into the false conclusion that armament firms are war mongers and as such should be cleared off the face of the earth. They were damned for making sales to non-industrial countries not capable of producing their own weapons. Now if the League Committee's recommendation becomes effective it is recommended that armament companies be permitted "to sell freely to Bolivia"! What was inherently wrong six months ago now appears to become inherently right. What were devils incarnate six months ago now appear to be saviors of world peace. If the recommendation carries, armament firms of all countries who do not coöperate will be charged with failure to perpetrate peace. The logic jumps so quickly that unthinking people are not allowed time to see the illogic of it all. Meanwhile the dastardly armament makers are left holding the bag: at one time excoriated because they provide the legitimate defense needs of non-producing nations; at another blamed if they fail so to provide. Their position is truly an unhappy one because, as the kaleidoscope changes, they are damned if they do and damned if they don't.

Everyone intimately familiar with the condition of some of the buildings and equipment at the various arsenals and depots of our military establishment throughout the country will hope that funds will be forthcoming for much-needed rehabilitation. No doubt a part of the new public works appropriation of $4,880,000,000 for work relief will be allotted for the use of the defense services. Extremely important as motorization, mechanization, the building of public roads and allied projects are to the military defense, the repairs and readiness of arsenals is, in our estimation, equally—if not more—vital.

Repairs of Arsenals

Not so long ago it was the good fortune of the writer of these lines to visit the Watertown Arsenal in Boston, Mass. This venerable establishment has a long record of development and manufacturing progress which, while not so lengthy as Woolwich, is very much akin to that British establishment in the nature of the work carried on. Watertown, under the guidance of renowned commanding and assistant officers and with the heritage of civilian engineers and craftsmen, stands preëminently among the technical, research and military production centers of the world. Its metallurgical laboratory has pioneered in the field of metals to such an extent that it might almost contend with the great General Electric works as the House of Magic. Watertown's advancement of the art of gun production already has revolutionized this ancient and honorable craft.

But in one respect, at least, this establishment is typical of other arsenals and depots in that portions of it must be allowed to go literally to rack and ruin for need of the wherewith to keep it in decent repair. The policy is extremely short-sighted both from the standpoint of readiness for the war-time mission and waste of the facilities now housed there. It is no

exaggeration to say that in some cases for the lack of simple roof repairs priceless machine tools are jeopardized almost to the point of worthlessness.

Modernization of military equipment is by and large a prime responsibility at the moment. The determination that modernization will be carried out is splendid judgment on the part of our military and civilian leaders. But the program should go the whole route: we should modernize our tactical machines and likewise modernize the technical machines from which the tactical machines are made. Many of our arsenals and depots have stood for years, and like the campaign for modernization of homes, these establishments should also be given every consideration. At least the buildings should be air-tight, water-tight, weatherproof; the limited personnel should not be compelled to operate under present discouraging conditions and the plant as a whole should be kept in readiness for its defense mission. John Taxpayer would be quite indignant if local authorities permitted municiple firehouses to disintegrate. He would feel doubly indignant if he could see the state of repair of some of these establishments which are essentially national conflagration-preventives. Those who will dispense the new work relief appropriations will be negligent of the national defense if they do not allocate ample funds for a technical construction and modernization program of our few Government-owned and Government-operated munitions plants. The program would come most certainly under the heading of work relief. Moreover our arsenals and depots, modernized and in good repair, are far more necessary than elaborate post offices, custom houses, Federal bank buildings and other palatial Government structures that now dot the land. Mural decorations, private suites with bath for high officials and bronze doorways seem to us to be all right if applied in moderation but the building program to furnish work relief will be way out of balance if it allows the investment represented by our arsenals and depots to rust away. If major emergency should ever come we would all hope that a little less had been spent on soil erosion of our forests and a little more on roof corrosion of our arsenals and depots.

ARMAMENT POLICY

EVERYONE who has the slightest interest in our national defense should give careful study to the War Department's statement of policy entitled, "The Production of Munitions" which is published in full in this issue of ARMY ORDNANCE beginning on page 201 (reprints of which will be furnished gratuitously to anyone who would like to have them). Aside from its clarity, its indisputable logic and its conciseness this statement bears the imprint of expert opinion. It comes at a time when there is great confusion of thought; it should go far to impress upon our people the problem of American munitions in its true light.

One thing, in particular, about this statement and its appearance at this time is worthy of emphasis. War Department policy is determined basically by the National Defense Act; it is intepreted by a group of individuals who devote their lives to the military profession, many of whom are freely and rightly accredited the rank of expert in this field. Their code of honor is matchless; their discipline is inbred; they are beyond doubt among the first of our nation's principal assets. This expert opinion is candid and unbiased; in every case it may not be correct but always it is truthfully formed. For it no one will claim infallibility. The fact remains that in this country we are blessed by having a corps of expert military advisers who always give their sincere opinion.

This being so, it is a pity that expert opinion on military subjects is not always given full faith and credit. So many of our fellow citizens are ready to be guided by expert opinion in every field of endeavor except that of the national defense. Yet this field is so specialized and it is so vital that one would think that here surely the expert would be accorded all the rights and privileges of those similarly qualified in the fields of medicine, law, engineering and the other professions. However the fact seems to be that when military and naval problems or the national defense in its entirety is concerned one guess is as good as another, that expert opinion ranks no higher and no better than that of the most unfamiliar commentator. This seems to be in line with prevalent opinion in other fields of national policy and, we repeat, it is a pity it is so.

In any event, War Department policy on American munitions as expressed in the statement referred to is expert opinion of the first order. It deserves to be known generally throughout the land. ARMY ORDNANCE will lend its meager effort toward making it so, confident in the belief that the rank and file of our fellows will accredit it the consideration it deserves and the conviction its soundness bespeaks. We are confident that every reader will hail this statement of policy and will agree that it is correct in principle and in detail. They will join with us in congratulating the Department on a splendid piece of work which, in our judgment, is the most timely pronouncement on the subject since the adoption of the National Defense Act of 1920 and which also is proof positive that the mandate of the Act for industrial mobilization planning has been and is being carried on with skillful understanding and faithful application.

These principles are splendidly epitomized in the statement of the Secretary of War, Hon. George H. Dern, before the House Military Affairs Committee on January 28, 1935. Mr. Dern appeared before the Committee to express his views on H. R. 3 (the McSwain bill to take the profits out of war) then under consideration. The Secretary said in part:

"I think it would be appropriate to state that primarily the object in war is to gain a complete and quick victory. The welfare of the country certainly demands that nothing be permitted to stand in the way of this paramount objective. In order to achieve this end, the full productive effort of the country will be required. In a modern war not only the armed forces but the whole nation, with all its resources, is engaged in the effort. The maintenance of the national morale demands that all elements of the population shall be treated with equal fairness and justice, and hence it seems highly important that profit be limited if not eliminated in war. Nevertheless, this worthy undertaking must not be allowed to assume any form that will hamper, cripple or destroy the more vital thing of producing the necessary war materials when they are needed. The preservation of the country must come first.

"The stimulated requirements of war for raw materials, fabricated products and services tend to cause a rise in price levels. Without control, price levels would soar to exaggerated heights, hence there must be Government control of prices in war. This is necessary, not only to prevent unfair and excessive profits from being made by individuals or corporations, but also, in a larger sense, for the purpose of holding down the cost of the war.

"The fixing of price levels is a major element in taking undue profits out of war, but it is not the only *element*. Price-fixing alone cannot accomplish the desired result. It must be supplemented by reasonable and effective procedure in letting contracts, and also by excess profits tax laws. During a war, the enlarged requirements for war materials make it necessary to use the product of the high-cost producer as well as that of the low-cost producer. It therefore becomes necessary to set prices at a level which will make it possible for each producer to turn out his part of the Nation's requirements without loss to himself. With such a price level, the low-cost producer is bound to make large profits. The only way to overcome this difficulty is to take the excess profits away from him through taxation.

"From the experience of this Nation, as well as others, the War Department is forced to the conclusion that in the event of war the major portion of our war supplies must be produced by private industry. It might prove suicidal to try to depend upon Government-owned plants alone. Assuming this premise, it follows that, so far as practicable, American private industry should be prepared to perform its war mission. This means that in time of peace industry should produce some war supplies, because any industry that has once produced such articles is thereafter better qualified to produce them speedier in time of war. In brief, our vital industrial problem in war is to produce the necessary war supplies, and to do it first, so that our enemy can gain no advantage from our shortage. *Time* is the vital element. This fact cannot be repeated too often.

"I may say that I fully concur in the proposals to license the manufacture and sale of essential war supplies and I do not think such procedure would be in the least detrimental to the National Defense.

'The word munitions, in the military sense, means whatever materials are used in war for defense or for annoying the enemy. Usually it also includes provisions, clothing, and military stores of all kinds. However, the word munitions is sometimes used in a more restrictive sense as meaning simply ordnance and ammunition. Speaking in this sense, the manufacture of all munitions in Government arsenals in time of peace would probably remove any objectionable features that may have developed in connection with the munitions industry, but the result might at the same time be detrimental to National Defense. In time of war, if history means anything, private industry, under civilian management, but under suitable Government control, would still have to be our main reliance.

"One element of weakness is the time that will be required to reach maximum production. The Government will be placed at a serious initial disadvantage if it is forced to turn to an industry entirely unfamiliar with the production of munitions. Such a situation would tend to augment rather than remove war profits, because, under the conditions that would exist, we would undoubtedly have to pay higher prices to insure early production. These higher prices would inevitably yield inordinate profits to many manufacturers.

"Again I wish to stress my deepest interest in and sympathy with any fair, reasonable and effective movement which will minimize profit in war. The three essentials of war are men, munitions and money. Victory cannot be achieved without a plentiful supply of each of these essentials. I must, therefore, again warn that any measures adopted must not be so restrictive or so binding in character as to prevent reasonably prompt negotiation and agreement with industry to produce the munitions of war, since any failure to produce munitions when needed may have to be paid for, not in dollars and cents, but in lives and the consequences of possible defeat."

How Small the Fry!

ABOUT a year ago when the great propaganda drive now in progress against American munitions was begun, private producers of armament in the United States were referred to as "small fry." The rolling clouds of confused issues which have followed in the storm have conveniently obliterated this admission. We have not seen or heard anyone who has called attention to the smallness of the fry in actual figures. While admitting that in the case of our private manufacturers the armament production is, in most cases, 1 or 2 per cent of the total industrial output measured in terms of dollars and cents, public opinion is being led away from any knowledge of the actual armament production by private concerns in the United States. When the truth is known the fry is so small that it takes the bottom out of the flimsy platform on which much of the argument rests.

It is a fair assumption, we believe, to say that the present complaint is based on the premise that our United States armament manufacturers have been exporting huge quantities of military equipment and consequently that these activities provoke war. We digress for a moment to call attention to the distinction between provoking war and supplying non-industrial countries with the materials they need for their legitimate national defense. While engaging in the latter, it has not been shown that war-provocation is the policy of our producers. However, the facts concerning the United States' share in the world trade in armaments are easily obtainable from the public records for 12 years, 1922-1933.

In 1922 the Department of Commerce of the United States began the monthly publication of statistics on the exports of all classes of arms and ammunition. Anyone really interested in the subject can subscribe for this statistical service at the small fee of $1 a year. The monthly reports are in mimeographed form and show the quantities and money value of various classes of armament and the countries of destination. These classifications are quite general including items of both a sporting and military nature—and in some cases fireworks. Nevertheless we are able through these figures to get some idea of the actual smallness of the fry. In making the compilation some conversion factors must be used. Metallic cartridges from 1922 to 1930 were reported in pounds; thereafter they were reported in thousands of rounds. Hence the figures for the years 1931, 1932 and 1933 for this item can be converted into pounds at an average estimated weight of 24 pounds per 1,000 cartridges. Converting to weight, the totals exported in tons are, approximately: Military rifles, 350; machine and heavy ordnance, 200; metallic cartridges, 2,500; explosive shells and projectiles, 1,400; revolvers and pistols, 30; military smokeless powder, 3,770; other military explosives, 1,490. *The total weight of all shipments from the United States during the twelve year period is 9,740 tons.*

Indeed the fry is small! The total amount of military arms and ammunition shipped out of this country over the twelve year period if assembled together would not total 10,000 tons. *If shipped at one time our twelve-year exports would constitute but a single cargo for one modern freight vessel.*

Men and Munitions

An Editorial

MAJ. GEN. LEONARD WOOD, of revered memory, once wrote: "It is tremendously difficult to interest Americans in this (the military) side of the Government. They are so prone to think that a large population and a great deal of money are sources of strength—not realizing, perhaps, that in these days when the weapons of war require years to manufacture a rich nation can be plundered and robbed simply because it is caught unprepared for the struggle." As Mr. Herman Hagedorn, author of "Leonard Wood—A Biography," observes in this connection, "Wood had faith that if the public could only be made to know the unprepared state of the nation they would act." Mr. Hagedorn describes an incident of those days when a Congressman McLachlan introduced a resolution which was adopted by the House of Representatives calling upon the War Department to make public the then status of the national defense. A great furor later arose over the method by which General Wood's memorandum outlining the numerical deficiency of our Regular Army, our lack of reserves to fill guns, supplies and projectiles for the Coast Artillery and deficiencies of organization were eventually prevented from coming to the public notice.

This historical incident is here recalled by way of contrast with conditions today. It may be said that our state of relative unpreparedness is something akin to that which existed in the days of General Wood. But it cannot be said, that any American citizen with even a half-hearted interest in the subject is prevented from knowing something of the true status of our military preparedness if he is interested enough to look into it.

THE annual report for 1934 of Gen. Douglas MacArthur, recently made public, furnishes the information. This is a state paper in every sense of the term, it ought to be studied and pondered by everyone who has any concern for our national defense. It could be taken to heart also by some of our fellow-citizens who seem to have no such concern—not being interested in factual data where things military are involved. It contains so much ground for thought that there is little wonder it is not popular reading. This may be accounted for by the estimate of general gray matter once described in these words: five per cent of our people think, another five per cent think they think, the remaining ninety per cent would rather die than think.

The MacArthur report can be summarized—with very liberal use of quotations—under the two military essentials, men and munitions. As in the days of General Wood, the country should know our exact status regarding both. On the first score—the status of our personnel—the facts as detailed by General MacArthur are as follows: The National Defense Act fixed the enlisted strength of the National Guard at approximately 425,000, "a figure which has never yet been remotely approached" as today the Guard aggregates about 190,000 in all ranks, organized into eighteen infantry divisions and supporting troops. Studies of the War Department extending over a long period of time have invariably concluded that this component, our only civilian component in which both officers and enlisted men are organized into tactical units, should be maintained at a minimum strength of 210,000 of which the present figure is not far short. The only added expense for this recruitment of the Guard, whose purpose is the early reinforcement of the Regular Army in emergency, would be merely the additional appropriations to sustain the necessary training program of 48 armory drills and 14 days in the field annually. As General MacArthur says, "The Guard has consistently progressed in efficiency and has fully justified the expenditure of Federal funds in its support."

The current strength of the Officers Reserve Corps, which is the only component of the Organized Reserves extant, is approximately 89,000. The enlisted Reserve Corps, as provided for by the Defense Act, is non-existent. The needed strength of the Officers Reserve Corps is based upon the initial needs of a mobilization in which Regular Army and National Guard divisions would eventually have to be supported by an equal number of reserve divisions to be mobilized after the beginning of an emergency. These officer requirements total 120,000. The Reserve Officers Training Corps, the principal feeder for the Officers Reserve Corps, has no fixed strength. As to this component, General MacArthur very rightly observes:

"This feature of our military preparation is frequently subjected to bitter attack by radicals, pacifists, and the uninformed, who profess to see in the Reserve Officers Training Corps a danger of militarism, although collectively and individually the American Army not only constantly teaches but thoroughly exemplifies supremacy of civil over military authority. The law has required military instruction in our land-grant colleges since the Civil War, and any militarizing effect on our people would long ago have been apparent. The inaccuracy of such charges has in fact been so obvious that, except in isolated instances, they have been consistently repudiated by the schools and students themselves. Particularly enlightening in this regard are the results of a survey conducted some 2 years ago by the Bureau of Education among many thousands of graduates of the Reserve Officers Training Corps. The report, contained in Pamphlet 28 of the Interior Department, shows the almost unanimous support accorded to the movement by the men who have participated in it."

As to the Citizens Military Training Camps, the Chief of Staff urges that they should provide one month's training for not less than 50,000 young men annually. Due to variation in the appropriations provided for this purpose, the maximum strength ever attained was 38,000 trainees, while in 1934 this figure fell to 14,000.

THE General's discussion of the status of our Regular Army is so important that we quote it at length:

"The Regular Army is the model, instructor, and, since composed of full-time professional personnel, the immediately available element of the Army of the United States. Its missions are many and vital to the success of the American system of defense. Deficiencies in other elements of our military system are largely localized in their effects, but those in the Regular Army are almost invariably reflected in serious consequences throughout the Military Establishment.

"The National Defense Act fixed the strength for this component at approximately 18,000 officers and 280,000 enlisted men; figures which Congress and the War Department believed to represent the lowest level at which the Regular Army could effectively perform all its missions.

"The maximum numbers appropriated for since 1922 have been 12,000 officers and 118,750 enlisted men. This is so far below essential requirements that for more than 10 years the War Department has urged the necessity for restoring to the Regular Army a portion of the strength lost through budgetary limitations.

"Peace-time responsibilities of the Regular Army include the provision of garrisons for foreign possessions; the instruction of civilian components; maintenance of a skeletonized supply and administrative overhead for routine operations of peace and capable of meeting the serious problems incident to a major mobilization; provision of garrisons for coast defenses; maintenance of a well-balanced tactical force for emergency use; and development of all the plans, policies, and general methods applicable to the Army in war and peace. Finally it must serve as the great experimental and development laboratory for the production of equipment and of tactical doctrine and unit organization.

"Requirements for overhead and administration, for instruction and planning, and for an efficient mobilization nucleus must be satisfied regardless of the total strength of the Regular Army. As an unfortunate result, existing shortages are most keenly felt in that portion of the professional force where both efficiency and sufficiency are mandatory; namely, its fighting elements.

"The full assurance of national safety sought by the amended National Defense Act of 1920 cannot be attained with a lesser force than that authorized in that law. Nevertheless, the War Department, keenly appreciative of the need for economy, has for years engaged in continuing studies to determine the minimum strength at which the professional force could be expected to discharge with reasonable efficiency its vital missions in peace and emergency. These studies have always assumed satisfactory efficiency among all components of the Army, have cut mobilization and administrative nuclei to the bone, and have reduced foreign and coast defense garrisons to dangerously low figures. Under these conditions and favorable assumptions the irreducible minimum has been fixed at 14,000 officers and 165,000 enlisted men.

"Brief consideration of the distribution of the existing Regular Army gives clear impression of its insufficient strength to perform satisfactorily all of its peace and war missions.

"Garrisons of important foreign possessions should be sufficiently strong to sustain themselves for a considerable length of time in any emergency, since the safety of certain of these posts will always be of the most profound importance to the United States. Yet in no case have we been able to assign to any of them the numbers that repeated studies show to be demanded by prudence. The total numbers now assigned to this duty approximate 1,900 officers and 36,000 enlisted men.

"Deducting these figures from the total numbers appropriated for in recent years, there are stationed in continental United States approximately 10,000 officers and 89,000 enlisted men. Parenthetically it is pertinent to remark that this aggregate force is smaller than the regular army that Germany, a nation of 60,000,000 people, was permitted to retain as a mere police force, under the terms of the Versailles Treaty. After all essential overhead, instructional, and similar needs have been satisfied on a minimum basis, there is left for organization into tactical units in the United States approximately 3,000 officers and 50,000 enlisted men. Due to the requirements of civilian training, these units are scattered in small posts and detachments throughout the length and breadth of the country. This reduces transportation expenses for civilian trainees attending summer camps and keeps a small number of professionally trained soldiers available in every section. But combined training by the various arms and services of the Regular Army is necessarily limited to small concentrations.

"The war strength of an infantry division is about 20,000. The lowest strength at which it can be effectively trained and kept immediately ready for effective action is approximately 12,000. The National Defense Act contemplated the maintenance in continental United States of nine regular divisions of this size, supported by necessary groupments of special troops. At present we have but 3 extremely skeletonized divisions and 6 weak brigades, averaging about 6,000 and 2,000, respectively. Subordinate units are scattered over considerable areas, and all are not only far too low in authorized strength but are further reduced in actual practice by heavy demands incident to post maintenance and other special purposes. Many garrisons are so small as to constitute little more than service detachments for local maintenance and for civilian training camps, and in emergency will be required to absorb such large contingents of recruits in order to attain a reasonable combat strength that the speed and efficiency with which they can take the field will be greatly reduced.

"As a further consequence of its extreme dispersion and its paucity in numbers, the Regular Army's ability to set aside a small, well-balanced field force for prompt employment in emergency has been badly impaired. This is a matter for real concern, and in itself would constitute sufficient support for the conclusion of the War Department that the regular forces should be materially increased."

THE enlisted reserve as provided for in the Defense Act has been a nonentity since the Act was adopted. Conditions of the intervening years now compel the reopening of the question of providing a suitable enlisted reserve. General MacArthur's suggestions for so doing would utilize Regular Army enlistments for this purpose. He would divide enlistments into two periods, one with the colors to be followed for a stated time in the reserve forces.

"Pay for the reservist need be no more than nominal, sufficient only to insure that he will periodically present himself for physical examination and keep the War Department informed as to his exact location. In return the reservist would be required by law to report for military service immediately upon receipt of instructions from the President. The minimum eventual strength of this Reserve should be at least sufficient to raise the Regular Army promptly to its full authorization of 280,000, thus assuring the effectiveness of the forces covering the mobilization of the Nation. If the active strength of the Regular Army should be raised to the required 165,000, this would mean that the Enlisted Reserve should number approximately 120,000. Such a force, allowing an annual pay of $30 for the individual reservist, would entail an increase in appropriations of not over $7,000,000 for all expenses created thereby. The tremendous

advantages to the Government would make such an expenditure, by comparison, almost insignificant."

In summary, the strength of our Army today and its minimum requirements are:

"*The Defense Act authorized* an enlisted strength for—
The Regular Army of 280,000.
The National Guard of approximately 430,000.
Enlisted Reserve of indefinite size.

We now have—
In the Regular Army, 118,750 enlisted men.
In the National Guard, 175,000 enlisted men.
The Enlisted Reserve is practically nonexistent.

We need—
A Regular Army of 165,000 men.
A National Guard of 210,000 men.
A well-trained Enlisted Reserve of not less than 120,000 men.
An Officers Reserve Corps (active portion) of 120,000, as against the 89,000 now obtaining."

TO read General MacArthur's analysis of our munitions situation is to emphasize by contrast the ballyhoo now occupying the public prints on the subject. The MacArthur report is factual, the writings of our defense critics are not always so. Taken in conjunction with the statement which appears on page 201 of this issue of ARMY ORDNANCE, we have the well rounded out policy of the War Department on this extremely important question. The following quotation from General MacArthur's report supplements the declaration of policy and becomes a charter on the subject. He says:

"Almost every important cause for change in tactics, training methods, and detailed organization of military units has its origin in scientific accomplishments in the fields of transportation and communication, weapons, and other technical equipment useful to an army operating in the field. Modernization implies the *development and acquisition, in all necessary types, of equipment of maximum efficiency, and the adoption of methods calculated to produce the most effective results from their coördinated use.*

"Ten years of relative stagnation in this respect cannot, under any circumstances, be overcome instantaneously. To illustrate: Even after technicians have successfully completed the laborious work of developing a satisfactory model of a particular weapon, a sound doctrine affecting its use cannot be perfected solely upon a knowledge of its performance characteristics. The Staff is justified in formulating general policies with respect to employment, organization, training methods, and supply and maintenance only after new weapons have been procured in sufficient numbers to undergo thorough tactical experimentation. But the production of even small quantities of such new and special mechanisms requires time—often many months. Moreover, results obtained in this step-by-step procedure must constantly be checked against those attending similar efforts in related fields; for instance, progress toward mechanization must be influenced by developments in ammunition, antitank weapons, transportation facilities, and the like. Finally, there remains the task of training and indoctrinating the whole Army in the technic and tactical uses of the new equipment as it becomes available. All this manifestly is a time-consuming process, and clearly indicates the need for promptitude in initiating corrective programs whenever glaring deficiencies are found to exist.

"The inadequacy of the American Army's present equipment is best demonstrated by specifically comparing some of its principal types with models which have been developed since the World War.

"The Army's cross-country combat vehicles—commonly known as 'tanks'—are hopelessly out of date. This class of weapon was brought out during the World War to provide protection for infantry in the open against the mass of small-arms fire which swept the battlefield. Its purpose was to restore to the attack a measure of the power it had lost to the great defensive strength of organized small-arms fire, particularly that of machine guns.

"The earliest models of these weapons used on the western front were almost complete failures due principally to mechanical weaknesses. Intensive effort between 1915 and 1918 improved them materially, but even so, the best types appearing before the armistice were so susceptible to mechanical failure that many able combat soldiers were extremely doubtful that they could ever attain any important tactical value except in a special situation such as existed on the western front. The so-called 'light tank' with which the American Army emerged from the war weighed about 7 tons, was capable of a maximum speed under favorable conditions of about 4 miles per hour, was armed with either a machine gun or a 1-pounder cannon, and carried sufficient armor to protect against small-arms ammunition then in use. It was mechanically unreliable.

"The rapid advances being made in antitank defenses toward the close of the war proved so effective that a successful future for tanks was clearly dependent upon marked improvement in their performance characteristics. Every major power initiated construction programs to this end, our own efforts being handicapped, as in all other directions, by the paucity of funds provided for the purpose. But, by devoting every available dollar toward the development of a satisfactory experimental model, there were finally produced single units of real promise. The latest types are capable of a sustained speed of some 40 miles an hour on roads and of some 20 miles an hour across country, except in difficult terrain. These advances have been accompanied by equally significant ones in the reliability of the machine and in the effectiveness and power of its armament.

"We find ourselves at present in this situation: We have on hand some hundreds of the World War tanks, totally unsuited to the conditions of modern war and of little value against an organized enemy in the field. Of tanks that can be classed as modern we have a total of 12, only 1 of which is of the type determined by tests to be the most efficient. Funds provided in the 1935 appropriations will secure for us in the near future a total of 64 tanks and combat cars with which a real beginning can be made toward the development of modern tactical doctrine as applied to them. This encouraging advance still leaves us, except in the efficiency of the model now available, relatively far behind in this phase of military preparation.

"The most effective field gun of the World War was known as the 'French 75-mm.' The American Army had about 3,500 of these in its possession upon the signing of the Armistice and today it is the weapon with which our Field Artillery units are equipped. Compared to models which have been produced since that time, it is a markedly inferior piece. Its

maximum traverse without shifting the trail is 6°, while it cannot be fired at the longer ranges except by digging a hole in which to drop the spade. It is incapable of rapid transportation on its own wheels since these are of the traditional wood and steel construction, and fast movement invariably results in damage to the mechanism of the gun. The latest model field gun developed in our service has, from a single position of the trail, a traverse of almost 90° and an elevation of 45°, giving it an enormously increased flexibility of fire. Wheels have been developed which permit towing of the gun at high speeds with no resulting damage. Manifestly a unit armed with the new weapon would enjoy a tremendous advantage over any equipped with the older type. Only through major alterations can the large number of guns now on hand be given the approximate characteristics of the new weapon. The project should be promptly initiated, since increased mobility in the other arms will be largely wasted unless accompanied by a comparable increase in flexibility of artillery fire and the speed with which artillery units can be brought into supporting positions.

"In Infantry equipment technical advances have also been important. The magazine rifle, caliber .30, model 1903, was undoubtedly the most efficient military rifle of its time. Equipped with a bayonet, it has been the basic weapon of the American Infantry for 30 years, during which time improvements have applied solely to types of ammunition used. As a replacement for this weapon there has been developed a semiautomatic rifle of extraordinary efficiency. Its weight is no greater than that of the older model while its rate of accurately directed fire is three times as high, and fatigue incident to firing is much less. So far we have only 80 of the new rifles, with 1,500 provided for in the current appropriation bill.

"Important improvements have been made also in all types of small-arms ammunition. The range of the normal bullet has been almost doubled, and armor-piercing ammunition has been greatly increased in efficiency. In machine guns the most important improvements relate to the caliber .50. At present we have a serious deficiency in this type which, of all weapons so far produced, offers the greatest possibilities for defense against fast-moving tanks and is, in addition, particularly effective against hostile aircraft.

"Another development of great significance involves antiaircraft matériel. Weapons used for this purpose during the World War were largely of an improvised character and consequently of low efficiency. Ever since, technicians have been developing machine guns and rapid-fire cannon so designed as to be particularly suitable for fire against air targets. Great improvements have been made also in instruments for the rapid and accurate adjustment of fire and in intelligence systems for the detection of the approach of hostile aircraft. Without appending any technical description of this matériel, it is sufficient to say that its efficiency is such as to constitute, when employed in quantity, a distinct threat to many types of air attack. Its value is unquestioned, in spite of which fact we have been able to procure only an insignificant amount. As in other activities, we have been forced to resort to expedients for the utilization of obsolete equipment, with the result that in this important matter we are likewise woefully behind the times. This equipment, in general, is intricate in design. Its production therefore requires time, as does also the attainment of the necessary skill in its operation. The importance of acquiring reasonable amounts of this equipment is further emphasized by the possibility that its employment may become vitally necessary in the very first phases of any future emergency.

"Improvements in transportation, particularly motor vehicles, have been largely a product of commercial activity, as distinguished from those made in strictly military equipment. These improvements have opened up great possibilities for increasing mobility through substitution of motor vehicles for horse and mule transportation. Until last year almost the only equipment available for use consisted of war stocks, which are outmoded, inefficient, and expensive to maintain.

"During the fiscal year 1934 an allotment of $10,000,000 was made to the War Department by the Public Works Administration to be applied to this glaring deficiency. Equipment is now being procured under this authorization, but we are still far from attaining the necessary progress, and additional sums are urgently needed for the purpose."

WE have not alluded in this summary to other important developments so ably described by General MacArthur in his report, including the present organization into four armies in the Continental United States, the adoption of a G. H. Q. Air Force, the status of the promotion system, pay and training. All are important matters but collateral to the two essentials, men and munitions. The conclusion drawn is the perfectly obvious one which all citizens who have not completely lost their minds must take to heart:

"Crises that result finally in the employment of defense forces give little warning of their approach, and it is futile to hope that there might be accomplished a reasonable preparation after growing tension once indicates immediate danger. Armies and navies, in being and known to be efficient, give weight to the peaceful words of statesmen, but feverish effort to create them when once a crisis is imminent simply provokes immediate attack. Moreover, individual proficiency in the profession of arms and development of efficient fighting organizations both require time, no matter what the intensity of effort or the lavishness of expenditure. Reasonable preparation constantly carried forward as a feature of national policy is not only necessary to assure avoidance of the bitterest consequences of war but is a wise investment in the maintenance of peace."

The crux of our national defense—underlying men and munitions—is *time*. It must be taken by the forelock, not for inordinate military preparation, not for aggression, not for anything but for simple national defense. Circumstance has brought together in this issue of ARMY ORDNANCE three tremendously important military pronouncements the statement of War Department policy on munitions production—page 201; the statement of Secretary Dern on war profits—page 231; and the statement by General MacArthur. In the first the doctrine comes back to: "*Time* is one element in war that cannot be purchased at any price"; in the second "*Time* is the vital element"; in the third ". . . proficiency . . . and development . . . both require *time*." Our policy and our present status are predicated on the irreparable value of *time*. We must take every reasonable means at hand to prevent its loss. Without recognition of this fact and measures to assure that our defense will not be in jeopardy by waste of this all important element our men and our munitions are in vain.

This is national policy translated into actuality. Anything short of it—in philosophy and practice—will not do.

Association Affairs

DEATH dealt heavy blows to the Army Ordnance Association during the past two months. It took from our midst Col. William C. Spruance, a vice president; Mr. Ralph M. Dravo and Mr. Pliny E. Holt, directors. Seldom can any organization boast among its directive officials three gentlemen who possessed and exerted all the attributes of leadership and public spirit as they. Any movement fortunate enough to have had their counsel and cooperation, as the Army Ordnance Association did for the past fifteen years, can boast a splendid heritage. Their passing from our ranks is a loss of the first magnitude; we who carry on in their absence are somewhat shaken without the reliance of their always kindly and effective assistance. They leave us at a time when the very principles for which they and their fellow members have stood so valiantly seem to be under terrific attack. The passing of each is to the cause of munitions preparedness in the United States indeed as the loss of a Stonewall Jackson was to another great cause. But theirs will not be a lost cause. In their leaving it renewed determination will grip the hearts and the memories of those who carry on—determination for the success of the principles which they knew, as all of us know, to be vital to the national defense.

WILLIAM C. SPRUANCE

WILLIAM CORBIT SPRUANCE, vice president of the Army Ordnance Association since 1927, charter life member, donor of the Spruance Endowment, and Association Medalist (1931), died at Wilmington, Del., January 9, 1935, after a short illness. No one had greater loyalty to the national defense than he. Engineer, administrator, officer of distinguished service during the World War, leader in all civic enterprises for the well-being of his fellows, Colonel Spruance—"Bill" as his old friends will remember him—was a man of men.

COLONEL WILLIAM C. SPRUANCE

Born at Wilmington, Del., September 26, 1873, the son of William Corbit and Maria Louisa Spruance, Colonel Spruance was graduated from Friends School, Wilmington, in 1890. He completed his course at Princeton University in 1894 and received the degree of Electrical Engineer from the same University the following year. He engaged in the practice of his profession until 1903 when was begun his long association of 31 years with the duPont Company, a service which was interrupted only during World War when he served as an officer of the Ordnance Department. In December, 1917, he was called to active service as a major of the Ordnance Reserve Corps. While in active service he was promoted to lieutenant colonel; in October, 1918, to colonel. He served as Chief of the Explosives and Loading Division of the Ordnance Department, a member of the Commodity Section on Explosives of the War Industries Board and of the Committee on Explosives Investigations of the National Research Council. He was honorably discharged from the military service February, 1919. For his World War service he was awarded the Distinguished Service Medal with the following citation:

"For exceptionally meritorious service to the Government on duty of great responsibility, first as Chief of the Powder Section, Production Division, Office of the Chief of Ordnance, in which capacity he was charged with securing the production of all powder supplied to the United States Army; and later as Special Assistant to the Chief of Ordnance in charge of chemicals, propellants and explosives, and Chief of the Explosives, Chemicals and Loading Division, Office of the Chief of Ordnance, in which capacity he successfully organized the industry of the country so as to yield at all times an ample supply of powder, not only for the needs of the United States Army but to some extent for the needs of our Allies."

A leader in his profession, Colonel Spruance was instrumental in effecting many advancements in the development and production of military and commercial explosives. In the years of peace his great ability helped to achieve for his company the high place it holds among the assets of our national life for the advancements it has made to the common good. During his lifetime he was given the rare distinction of having one of the company's plants for the production of celophane bear his name, an honor heretofore accredited only to the memory of those non-living officials who had helped bring it success.

In the councils of the Army Ordnance Association Colonel Spruance had the zeal and constancy that come only from wholehearted devotion. Never a meeting of its board of directors but only a weighty reason could interfere with his attendance; never a problem of management or enterprise but his sound judgment and personal interest were freely given; never an opportunity to advance the cause of national defense but every fiber of his kindly heart and mind exerted its best patriotic impulse—never any problem confronting the ordnance phase of our military situation but "Bill" Spruance was at hand to give of his best toward its solution. When the idea was broached of forming a group of executives and engineers who, through first-hand contact with the problems in war, knew the stupendous problems of American industry in time of national emergency—the idea which latter became the Army Ordnance Association—he was a member of the organization committee and when the Association took form in 1919 he became one of its directors. He served in this capacity until 1927 when he was elected to succeed the late Gen. Guy E. Tripp as a vice president.

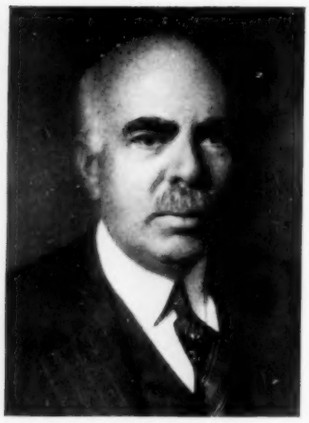
Convinced of the necessity for instilling in the minds of our younger engineers a knowledge of the American munitions problem and determined to cultivate among them some familiarity with it, he presented to the Association in 1928 an endowment to provide for memberships among the senior class of the Engineering School of his alma mater, Princeton University, and for faculty membership also. The Spruance Endowment, fashioned of his own benificence, now and in years to come will stand as a beacon to his own memory and will recall his share in formulating the principles of industrial preparedness.

Because it recognized the obligation which the country as a whole was under to one who had thus pioneered in the cause of industrial preparedness, the Army Ordnance Association, when it founded its Ordnance Medal of Merit in 1931, selected Colonel Spruance to be one of the first recipients. The Committee on Award in its citation which accompanied the medal bestowed it upon him "for unusual accomplishment and outstanding service in the advancement of industrial preparedness." The Medal was presented by the then Chief of Ordnance, Maj. Gen. Samuel Hof,

at a special meeting of the Philadelphia Post May 25, 1932. Colonel Spruance was instrumental in establishing the Philadelphia Post and at the time of his death was one of its vice presidents.

Ralph M. Dravo

JUST as the last issue of Army Ordnance went to press word was received of the death of Mr. Ralph M. Dravo, president of the Pittsburgh Post and a director of the Association. He died at his home, Sewickley, Heights, November 11, 1934, in his 66th year. With his brother, the late Francis Dravo, he was co-founder of the system of Dravo Companies united under the name of the Dravo Corporation of which he was chairman. Throughout his active career the Army of the United States and its interests were among his major objectives.



Ralph M. Dravo

Of his engineering and commercial genius there are many monuments to attest his sterling qualities. Thus from the following editorial tribute to Ralph Marshall Dravo which appeared in *The Waterways Journal* an analogy can be made of the application to his place in ordnance activities so that the sentiment expressed applies equally well:

"Dravo! How often we of the river hear it spoken, with a note of respect, out of a clear sky and by itself. It is sometimes uttered in the dead of night in the wheel house when some pilot, musing to himself, gives outward expression to his inward thought. For none know like the men of the river all that the name Dravo represents on the Ohio, the Mississippi, and their farflung tributaries. Pass a boat, go under a bridge, lock through a dam, or land at some modern terminal; often, in direct succession, all were built by Dravo. Pilots have been known to blow the whistle to pass a tow of steel, a tow of contractor's equipment, and a tow of sand within a hour's time, all Dravo. Small wonder the name Dravo is one to conjure with on Ol' Man River.

"The measure of respect with which a family name is spoken is an unfailing index of the degree of estimation in which its members are held. So it is significant that in years of travels up and down and along the rivers we have never heard spoken without a note of respect the name Dravo.

"All this is by way of leading up to a statement, one we are so loath to make that we unconsciously have written in a general way about the name Dravo to postpone writing the stark unescapable fact that Ralph Marshall Dravo is dead; that there has passed away the man who was both Chairman of the Board of the Dravo Corporation and President of The Dravo Contracting Company.

"Mr. Dravo had not been well. The end came, we hope peacefully, last Sunday night in his home at Sewickley Heights below Pittsburgh, overlooking the river he loved so well and honored so much."

When the Pittsburgh Ordnance District was established in 1917 Mr. Dravo was appointed its first chief. Promptly and efficiently he organized the district and carried on its important work until after the Armistice. In recognition of his service he was awarded, in 1919, the Distinguished Service Medal for "the intelligent and enthusiastic manner in which he effected cooperation between the Ordnance Department and manufacturers in the district thereby obtaining the maximum production of munitions in a minimum of time."

When the Ordnance districts were re-established in 1922 for the decentralization of industrial mobilization planning, Mr. Dravo was again appointed district chief, which office he held until his resignation November 15, 1930. He then became a member of the District's Advisory Board.

Mr. Dravo was a graduate of Lehigh University and spent most of his business life in Pittsburgh, his native city. With his brother, Francis, who was an inseparable companion, he organized and directed the enterprises with which their names are associated. Both were active in all ordnance affairs and their deaths within a year of each other seemed to carry their close affiliation even to the grave.

Pliny E. Holt

PLINY EASTMAN HOLT, director of the Army Ordnance Association, died suddenly at his home in Stockton, Calif., November 19, 1934. He had served on the directorate of the organization since its foundation in 1919.

Boye Studios

Pliny E. Holt

Civic leader, engineer and mechanical genius of world-wide reputation, Mr. Holt took an active interest in ordnance affairs for many years. So keen was his devotion to the cause that on the occasion of the annual meeting of the Association last year he made the trip from the West Coast to be present. This was typical of the man and of his loyalty to every sound movement, local, regional and national, with which he was identified. In later years development of the port of Stockton became one of his principal objectives. At the time of his death he was head of that city's Port Commission.

Mr. Holt was born at Concord, N. H., in 1872, the son of William Harrison Holt who, with his brothers Charles H. Holt and Benjamin Holt started the firm of Holt Brothers in San Francisco in 1869. After attending the University of Minnesota he became associated, in 1896, with his uncle, Benjamin, at the Holt Manufacturing Company plant. His engineering skill was a notable factor in the success of the concern.

Probably no name is more intimately connected with one of the greatest advancements in modern military developments than his own. It was the Holt tractor with its commercial and agricultural uses that paved the way for many of our World War and post World War developments of artillery transport and automotive combat vehicles. So close was his coöperation with the Ordnance Department that we have asked an officer who served with Mr. Holt to express in these pages an appreciation of his work for the national defense. Maj. Levin H. Campbell, Jr., a personal friend of Mr. Holt and an associate on many ordnance engineering problems, at our request wrote the following tribute:

"It is indeed with great humility and a full appreciation of my utter incapability of doing justice, even in small part, to such a great soul, that I write these few lines in memory of Pliny Eastman Holt, who recently died in California. If they serve to stimulate interest in the life of one who served his Country so well during and after the World War, my poor effort shall not have been in vain.

"This existence of ours which we call life often affords pleasures and extends privileges of a high order. To know Pliny Holt fulfilled both. Even more, it aroused all that is best in one. He was a dreamer of dreams, and his creative engineering ability and tireless energy in transforming his dreams to a practical mechanical application excited the respect and admiration of all.

Even greater though, as enduring through the years, will be the memories of the humanness of the man, the sweetness of his character and the cleanness of his mind. How his friends loved him! And how proud they were of his engineering genius and achievements, so modestly decried by him!

"His life is surely an example of 'rugged individualism' in all its finer aspects. As a young boy he left New Hampshire to join his uncle Benjamin Holt in Stockton, California, in the manufacture of the Holt 'Caterpillar' Tractor. I wish that space permitted me to recount even a few of the many delightful stories he loved to tell of those days. How he used to laugh when he remembered the trials and tribulations of that old steam driven tractor with the hickory tracks!

"From that crude beginning, however, was evolved the Caterpillar tractor used in such large numbers by the Allies during the war. From the Caterpillar tractor was evolved the tank of the World War, with its modern high speed successor. What a contribution to the successful outcome! The part played by Mr. Holt in the development of the tractor to its present stage of perfection is recognized throughout the industry, and many patents were granted him as a pioneer in the art. General Hodges, of Panama Canal fame, upon being introduced to Mr. Holt by the writer, exclaimed, 'Mr. Holt, I've long wanted to meet the man who pulled us out of so many holes during the construction of the Canal!'

"Such engineering skill and business leadership as was his in full measure was used by his company to establish the Peoria plant, which has become the main plant of the now Caterpillar Tractor Company. What a tribute to the vision of—again—that 'rugged individualism,' which has made our Country great!

"Mr. Holt's first active personal interest in the military dates from his work with the French Ministry of War, in the development of the self-propelled gun mount. The result of his work was seen in the equipping of several regiments of heavy artillery of the French Army with this type of ordnance in the latter part of the war. Upon our entry we find Mr. Holt in our Ordnance Department as engineer in charge of self-propelled gun mount design and production. He used to confide in his friends that under no circumstances would he accept a commission—and he didn't! But how in later years we delighted in retaliating by calling him 'Colonel' Holt!

"His work and accomplishments during the war period were truly remarkable, when we remember that he had little or no design precedent to follow in the self-propelled gun-mount art. No one knew whether a heavy gun could successfully be fired from a caterpillar track vehicle or not. What a thrilling sight it was therefore to see an 8-inch howitzer suddenly emerge from a dense thicket at Aberdeen in the Spring of 1918, come up to the line, fire a few rounds, and quickly disappear under cover! Yes, here was something new—history in the making!

"Due to various causes—principally our total lack of industrial preparedness, none of these caterpillar track weapons reached the Front, but even to this day the fundamentals of the designs prepared by Mr. Holt stand with little possibility of improvement. The self-propelled gun mount will some day come into its own, and thus again will his vision be triumphant.

"Upon the termination of the war, Mr. Holt returned to his Company, but his active and constructive interest in the Ordnance problem never diminished. As a charter member of the Ordnance Advisory Committee of the Society of Automotive Engineers, organized at the instance of General Williams in 1919, he continued to give freely of advice and help. We never found him too busy to answer a letter requesting guidance in what was, at that time, largely an uncharted sea. He was indefatigable in his work while organizing the San Francisco Post of the Army Ordnance Association. His interest never lagged, his patriotism ever burned with a bright flame; a truly great and sweet character whose influence will long survive and whose monument is—accomplishment."

The passing of this triumvirate, Spruance, Dravo, Holt, leaves vacant in our organization places that cannot be filled. But their leadership will always be an inspiration and the cause to which they gave so much must be stronger for their giving. Each leaves a renowned and lasting entry on the record of the technical and engineering progress of our national defense. To their memory will be pledged a greater devotion by all their friends and associates to the cause they helped so well to establish.

NEW MEMBERS

THE following have been admitted to membership in the Army Ordnance Association since the last issue of ARMY ORDNANCE: John Airey, Ann Arbor, Mich.; O. M. Anderson, Upham, N. Dak.; John LeB. Arbuckle, Columbus, Ohio; W. M. Austin, Metairie, La.; W. E. Bandemer, Ann Arbor, Mich.; G. K. Beckett, Hamilton, Ohio; Ralph H. Bertsche, Jr., Anderson, Ind.; F. R. Billingslea, Tulsa, Okla.; Frank C. P. Boyer, Garden City, N. Y.; Alfred L. Broadbent, Pasadena, Calif.; W. H. Cadwallader, Swissvale, Pa.; K. M. Conklin, Ann Arbor, Mich.; E. G. Connely, Omaha, Nebr.; Jasper E. Crane, Wilmington, Del.; George G. David, Ukiah, Calif.; Harold de Montfort, Channing, Mich.; William A. Elmore, Penns Grove, N. J.; R. L. Fairbrother, Quincy, Ill.; H. A. Fennerty, Alliance, Ohio; Albert Foster, Jr., South Orange, N. J.; G. W. Gardner, St. Louis, Mo.; George G. Garton, Cambridge, Mass.; E. Hampton Glaeser, New Ulm, Texas; A. N. Gustine, Ann Arbor, Mich.; A. E. Hart, Cleveland, Ohio; George R. Hays, Richmond, Ind.; Charles N. Henshaw, Cambridge, Mass.; W. B. Johnston, Cincinnati, Ohio; H. E. Josselyn, Ann Arbor, Mich.; Arthur D. Kurtz, Philadelphia, Pa.; F. Murray Leyde, Madison, Ohio; William G. List, Cincinnati, Ohio; Orwell Logan, Berkeley, Calif.; James I. Maloney, Upper Darby, Pa.; Edmond W. McDiarmid, Peoria, Ill.; Harry L. Moat, Wilmington, Del.; Richard Moore, Jr., Webster Groves, Mo.; W. B. Moore, Canton, Ohio; J. J. Morch, New York, N. Y.; B. F. Morphew, Sacramento, Calif.; Carson M. Mowre, New York, N. Y.; O. T. Nicholson, Shamrock, Texas; Carl D. Pratt, Tamaqua, Pa.; Laurence B. Reed, Plymouth, Mass.; John P. Rehling, Chicago, Ill.; Howard V. Rulison, Syracuse, N. Y.; James E. Shields, New York, N. Y.; George L. Smith, Washington, D. C.; Miles W. Standish, Kansas City, Mo.; G. A. Stile, Birmingham, Ala.; Eric C. Stone, Rochester, N. Y.; E. D. Stuart, Santa Paula, Calif.; R. L. Taylor, Columbus, Ohio; E. C. Thompson, New York, N. Y.; Robert E. Van Syckel, Upper Darby, Pa.; Arthur L. Vieweder, Philadelphia, Pa.; and R. T. Whitten, Compton, Calif.

NECROLOGY

SINCE publication of the last issue of ARMY ORDNANCE notice has been received of the death of the following members of the Association: Thomas J. Buckley, Tenafly, N. J.; H. G. Elfborg, Chicago, Ill.; and Edward J. Kearney, West Allis, Wis. To relatives and friends of these deceased members ARMY ORDNANCE, for its readers, extends condolences.

IN recent weeks the Association has been represented by invitation at meetings in various parts of the country for the discussion of the munitions problem. Quite a few of these gatherings are in the nature of debates—both "sides" being represented and questions from the floor being a part of the procedure. For the past fifteen years our organization has endeavored to cultivate sound opinion on this very important topic. Thanks to the present popularity (or should we say unpopularity?) of munitions and national defense such discussions afford opportunity to supplement the written with the spoken word. It is to be hoped that industrial preparedness, when presented to the general public through this means will be better understood by our non-technical friends who, of course, have an interest—whether always distinguishable or not.

Professional Notes

NEW ARMY TANK

THE appearance of the new Army tank in Washington recently enroute from Rock Island Arsenal to the Aberdeen Proving Ground created very favorable comment on the part of all observers. The new vehicle is welcomed as an advancement in the development of automotive combat vehicles and, representing as it does the experience and progress of many years of study, experts entertain high hopes for it as a solution of a great military engineering problem.

On the occasion of the vehicle's visit to the Nation's Capital on November 21, 1934, the following statement was issued by the War Department:

During the World War tanks were used in considerable quantity by the Allies. These tanks had a maximum speed of six or seven miles per hour. At the end of the World War our Army was equipped with a number of 6-ton tanks and some Mark VIII tanks, the latter weighing 44 tons. Several years ago the Mark VIII tanks were declared obsolescent. During the past year an Act of Congress has made the 6-ton tanks obsolete.

Following the World War the development of tanks has continued through the construction of successive experimental models. Finally, in 1927 and 1928 a light, full track tank was developed, having a maximum speed of 22 miles per hour, and a sustained speed of 14 or 15 miles per hour. During the course of the development of these full track vehicles, Mr. J. Walter Christie developed, patented and built tanks of the convertible type; that is, so designed as to run on wheels when used on the road and then permit the application of a track to be used across country. Mr. Christie's efforts provided the intermediate step in the development of tanks and permitted obtaining high road speeds.

During the past several years the Army has attempted experimental mechanization. A critical element of the mechanization was the ability to make strategic marches of several hundred miles and then launch an attack. With the full track vehicles having sustained speeds of only 14 or 15 miles per hour, this was not satisfactorily obtained, and the vehicles designed by Mr. Christie filled the gap, permitting strategic marches at speeds of 40 to 50 miles per hour, and then conversion to a track-laying vehicle for use in an attack.

The new tank which has been demonstrated during the past few days to high officials of the Army was designed by Ordnance personnel in the Office of the Chief of Ordnance, Maj. Gen. W. H. Tschappat. This work was greatly facilitated by the enthusiastic support of Maj. Gen. Edward Croft, Chief of Infantry, and personnel of his office. The tank is a full-track vehicle, and is capable of speeds greater than 50 miles per hour and a sustained speed of 30 to 40 miles per hour. The development of this tank is an outstanding automotive development applied to military uses during the past ten years.

After construction at Rock Island Arsenal, this light tank was tested for 2,400 miles over irregular terrain and on various types of roads. This test was conducted at the Arsenal. The tank was driven overland by Capt. T. H. Nixon and Mr. Joseph Proske, leaving Rock Island Arsenal on November 14th and arriving in Washington on November 17th. During this run all existing records for non-convertible track-laying vehicles were broken. The entire trip of approximately 900 miles was made at an average speed of 30 miles per hour. This included the time necessary in passing through the various cities en route. During one day the tank covered 336 miles in eleven hours.

The general characteristics of this light tank are: Length—12¾ feet; height—6½ feet; width—7 feet; weight—fully equipped and with personnel ready to fight—16,000 lbs.; maximum speed—50 miles per hour; sustained speed—30 to 40 miles per hour; engine—260 h. p. radial, air-cooled; track and suspension—special Ordnance design. The tank is equipped with one or two turrets. In every case it carries two caliber .30 machine guns, one caliber .50 machine gun, together with Thompson submachine guns. A crew of four operates the vehicle. A radio with an 80-mile range is provided.

High ranking officials of the Army, and numerous others, were much impressed with the flexibility of control, the easy riding qualities, and simplicity for war-time manufacture of this weapon.

RESERVE OFFICER PROMOTION

PROMOTION is important to every officer, no matter to which component of the Army he belongs. Promotion is the sign of progress and of the officer's qualification to perform the duties and assume the responsibilities of his rank.

To qualify for promotion to the next higher grade, a reserve officer must first earn a certificate of capacity. This certificate is an instrument in writing executed under the direction of the corps area commander, and certifies that the officer named therein is deemed to have the necessary professional qualifications to perform the duties and to assume the responsibilities of the grade and section specified. In order to obtain this certificate, the officer must demonstrate his knowledge qualifications and his ability qualifications, as follows:

Knowledge Test: First the officer must make official written application for examination for a certificate of capacity. The examination is divided into two parts, known as the "knowledge test" and "practical test" (paragraphs 36 and 38, respectively, A. R. 140-5). The knowledge test is a written examination covering the subjects required for promotion to the next higher grade in the respective arm or service. In the event the officer has successfully completed the extension school subcourses covering any of the subjects necessary for promotion he will be exempt from examination in those subjects. If, however, the officer has completed the *entire* series of subcourses of the knowledge test (20 Series for first lieutenant, 30 Series for captain, etc.), the War Department has ruled that it is not necessary for the reserve officer concerned to appear before an examiner as provided in paragraph 36, A. R. 140-5. Determination of the exemptions granted by completion of the series of subcourses is administratively accomplished by the Reserve Officer's Unit Instructor.

Practical Test: Second, having completed the knowledge test in all necessary subjects and been issued a certificate by the examiner, the officer then applies for the practical test. This is a practical demonstration, before a board of officers, of the applicant's ability to command the unit appropriate to his grade and assignment. His appearance in person before the board is necessary, notwithstanding any exemptions granted under paragraph 40 *a* to *e*, inclusive, A. R. 140-5.

R. O. T. C.: An exception to the above method of securing a certificate of capacity is made in the case of second lieutenants who are graduates of a senior unit of the Reserve Officers' Training Corps of a university, within five years from date of application for examination. The War Department has stated that these second lieutenants are exempt from examinations and tests *only in those subjects in which they have received training*, and they will be required to show military qualification in the subjects required for promotion, not covered while a member of the R. O. T. C. As each subcourse of the Army Extension Courses covers one of the military qualifications prescribed for promotion, R. O. T. C. graduates, after receiving their commissions, are urged to enroll promptly in the subjects necessary to qualify.

Briefly, the requirements for promotion are outlined as follows: (1) certificate of capacity for the next higher grade; (2) appropriate vacancy, except that a vacancy will not be required for promotion from second lieutenant to first lieutenant; (3) completed service in grade as follows: As second lieutenant, 3 years; as first lieutenant, 4 years; as captain, 5 years, as major, 6 years; and as lieutenant colonel, 7 years; (4) completed at least 14 days of active duty training and received therefor efficiency rating of at least "satisfactory"; (5) satisfactory report of physical examination.

Ordnance Training at M. I. T.

THE Ordnance Training Center at M. I. T. last year was one of the most comprehensive ever held at that institution. This Training Center was for the training of Ordnance reserve officers in the arms and service assignment group. Maj. O. J. Gatchell, Ord. Dept., was in command and Maj. Roger Taylor, Ord. Dept., was executive officer. Maj. G. W. Morse, Medical Reserve, acted as medical officer.

The courses offered were as follows: Course A: Military Instruction (Instructors: Majors Gatchell, Taylor, and G. P. Slade, Ord. Res.). This course was devoted to lectures and quizzes on: military courtesy, customs of the service, military discipline, military law, organization of the War Department, military organization of the Army, organization and functions of the Office of Assistant Secretary of War, organization and operation of the Office of Chief of Ordnance, organization and operation of an Ordnance District Office, duties of plant officers, adjusted compensation contracts, army finance and property accounting.

Course B: Inspection and Guages (Instructor: Maj. D. A. Lenk, Ord. Res); Course C-1: Production Methods, Elementary (Instructor: Maj. Earle Buckingham, Ord. Res.); Course C-2: Production Methods, Advanced (Instructor: Major Buckingham); Course E: Industrial Heat Treatment (Instructors: Capt. J. H. Zimmerman, Spec. Res.); Course F: Materials of Engineering and Specifications (Instructor: Captain Zimmerman); Course G: Introduction to Physical Metallurgy (Instructor: Lt. Col. R. S. Williams, Spec. Res.); Course I: Plant Design (Instructor: Maj. C. S. Robinson, Ord. Res.), and Course J: Recoil and Counter-Recoil Mechanisms (Instructor: Maj. A. F. Holmes).

With the exception of the military instruction which was compulsory, each student officer was permitted to choose his courses provided his time at class and required preparation totalled at least forty hours per week. More than fifty hours per week were not permitted except in rare cases. The hours of instruction were so arranged that there were few conflicts which prevented officers taking desired courses.

The instructors in technical subjects nearly all of whom were members of the M. I. T. faculty, were of exceptional ability and the instruction given was most intensive. In one course the progress was so rapid that in two weeks' time the ground covered was equivalent to a whole semester's work by M. I. T. undergraduate students under the same instructor.

In attendance there were twenty-seven student officers assigned to eleven different stations, including districts, arsenals, the Ordnance Office and Aberdeen Proving Ground. Interest and enthusiasm were keen and the work done by all students was of high grade.

No facilities were available for pistol practice and the hours of instruction were so long that no attempt was made to conduct infantry drill or any other practical military instruction.

The majority of the student officers lived in a group in an M. I. T. dormitory, kindly made available by the Institute authorities at very reasonable rates. Meals were served in the Walker Memorial Cafeteria. In general the coöperation of the Institute was as usual whole-hearted and complete, without which the training center could not have been so successful.

Active Duty for Reserve Officers

WITH the advent of another year Reserve officers are beginning to inquire about the possibilities of active duty training. They are cognizant of the provisions of Army Regulations (Paragraph 4—140-5), "The Officers Reserve Corps is organized for the purpose of providing a reserve of officers available for military service when needed. In accord with this purpose Reserve officers are, in time of peace, procured and trained for the organizations and activities of the Regular Army and Organized Reserves which would be first and most urgently needed in the event of national emergency."

Due to limitations of funds for training purposes there are a number of requirements specified by the War Department in respect of the selection of officers for active duty training. Among these is the inhibition that no Reserve officer who is drawing a pension, disability allowance, disability compensation or retired pay from the Government may be ordered to active duty. Only in exceptional circumstances will officers who have failed to pursue satisfactorily the inactive duty training prescribed be ordered to the annual 14-day active duty. There is also the general policy that from funds appropriated for training at least 80 per cent of the total number of Reserve officers ordered to active duty in the corps areas and departments will belong to the arms and at least 90 per cent of these will be of company, battery or troop grades. Further, priority in active duty training is given to those Reserve officers of the arms whose assignments are in the initial mobilization.

Training of officers of the arm and service assignment group is decentralized as far as practicable and conducted by corps area and department commanders. Officers of this group are not ordered to active duty for any purpose except with the Civilian Conservation Corps until made expressly available for that particular duty by the War Department.

Relating particularly to Ordnance Reserve officers who are of the general assignment group, this contingent is under the direct control of the War Department. Training for individual members of this group is determined by the Department and is arranged directly in each case with the appropriate corps area commander.

When appropriations warrant, selected Reserve officers are placed on 30-day active duty training at C. M. T. camps to assist in providing continuity of C. M. T. C. training and administration. Also Reserve officers from line or staff arms or services in such numbers and grades as are authorized by the War Department are placed on active duty with the Civilian Conservation Corps by corps area commanders. Periods of such active duty normally are for six months but corps area commanders, in the interest of greater diffusion of training, may prescribe a less time provided no period shall be less than 60 days. Tours may be extended at the discretion of the same authority.

These principles are applications of the primary objective of training which is to fit Reserve officers to perform the duties required by their mobilization assignments. The ultimate training objective is reached at the end of a training cycle of several years, the aim being proficiency in mobilization and efficiency in war duties. During the 14-day training period every effort is made to assure intensive application with the least possible time lost in travel, holidays, physical examinations, etc. Normally the tour of duty begins on a Sunday and terminates the second Saturday thereafter.

Directives for training of Ordnance Reserve officers at this writing are not available. In accordance with past practice it is assumed that eligible officers will be notified in the near future. Funds provided for training will be the governing limitation. It is earnestly to be hoped that training courses will be conducted at all the principal Ordnance establishments where they have been held in the past and that, with sufficient forthcoming appropriations, officers in goodly numbers will be ordered to attend.

Book Reviews

War Memoirs of David Lloyd George, 1916-1917. Boston: Little, Brown, and Company. 1934. $4.00.

IN this third volume of his memoirs Mr. Lloyd George reviews the major problems that confronted him upon his taking over the British direction of the World War. And with a liberal hand he distributes praise or blame among his colleagues and subordinates in a manner that gives the impression of a frank statement of opinions and facts, biased and very human. Incidentally the opinion, right or wrong, of the British Prime Minister during the years 1916 and 1917 approached close to the importance of a fact. Such utterances, even when couched in sarcasm of a pointed and revealing character, give the student welcome clues to the reasons for certain decisions that have been only partially explained. The first half of the book is devoted to questions subsidiary to the military situation such as the food problem, the submarine menace, shipping, and man power—matters of life or death to Great Britain at the time, but then as now overshadowed by the meaningless conquest of a few expensively fertilized acres in Flanders. In this connection it might not be amiss to quote from a letter written by George Washington to Lafayette: "No land force can act decisively unless accompanied by a maritime superiority," stated the Revolutionary Commander emphatically, and these memoirs are impressive in their revelations of British efforts to retain their priceless mastery of the sea. For a short period of time, professional obtuseness and German submarines brought the great Empire face to face with destruction. But, as has happened so often in the past, common sense and a people who recognize civil obligations as well as civil rights came to the rescue; the peril to their trade routes was subdued and victory became a probability.

Of extraordinary interest is the chapter headed "Psychology and Strategy." It contains much in the nature of conjecture, but conjecture by such an acute mind is sufficient to form at least a background for truth. Perhaps in the World War the weaknesses of human nature were nourished by faulty organization, but the testimony is damning, and for this reason should be pondered by every one in authority in order that the tragic errors that were made shall never be repeated.

The danger of preconceived notions has been dwelt upon weightily by the majority of military writers, but a simple declarative sentence in this volume brings the idea to life; "The planomaniac is blind." What a world of military wisdom is contained in those four words. After good sound plans have once been completed, with all the painstaking labor that they have involved, how few men are willing to toss them aside in order to grasp the fleeting opportunity that changing conditions have brought about? Thus the Allied generals tried stubbornly and loyally to carry out the Chantilly agreement in spite of the new situation that confronted them in 1917. In his comments on this aspect of the War, Mr. Lloyd George discloses the texture of his own mind, its flexibility which was perhaps his greatest strength, his opportunism which gives his enemies such ample scope. It would be valuable to know if the thoughts that he expresses now with regard to his military contemporaries were entertained by him in 1917.

Allied neglect of Russia and President Wilson's failure to prepare his country for war are included in the long list of omissions, blunders, and stupidities that are discussed, but the inquiring reader misses several points that it is hoped will be included in a later volume. The most obvious of these is the question, why did the British submit to the continued domination of French policies and politics?

These memoirs of one of the greatest popular leaders of the War are too important for any student of the period to miss, and in addition to their historical value, one is assured of a few evenings of lively reading. J. M. E.

A Glossary of the Construction, Decoration and Use of Arms and Armor. By George Cameron Stone. Portland, Me.: The Southmore Press. 1934. $10.00.

MR. STONE'S treatise is one to inspire the use of superlatives. Scientific to the last degree, documented as no English work on arms has ever been, it is packed with interest to the layman, the collector, the specialist in arms and armor. To other volumes in the same field, it will bear the same relation as the "Queen Mary" or the "Normandie" to the sea-strained tramp. Nothing in the field of edged weapons and the armor to protect against these has been omitted or slighted. Nor have firearms been forgotten. Nevertheless the book is not for the firearms enthusiast. But eleven of the nearly 400 references in the large bibliography that terminates the work are names familiar to him whose interest lies in projectile weapons. The remainder treat of the lance and bow, the sword and dagger, the flail and the javelin, and scores upon scores of other weapons, war engines, and armaments, the very names of which are strange and unusual. No time, no place, no race, has been neglected. From the dawn of history until the current moment, weapons of all types and varieties pass before us in endless procession. And not only are their nomenclature (with all known variations), construction, and employment adequately and faithfully described, but every one of any import is clearly illustrated, often in many forms.

Such a work should be above criticism, and the few misprints, miscaptioned illustrations, and other errors observed hardly merit comment. In one or two places the author exhibits some unfamiliarity with firearms, as when he states (under the caption "Rifling") that, " in most cases the grooves are now made with an increasing twist toward the muzzle." But we have already pointed out that the volume is *not* for the firearms enthusiast. However, he who loves cold steel will find it a veritable encyclopedia, and a source of reference material to which he can ever turn, sure of finding whatever he may seek, no matter how ancient or obscure.

The arms curator who fails to provide himself with a copy of this masterpiece will be akin to an English teacher who lacks a dictionary. It is not only fascinating; it is indispensable.

C. G.

A Study in Personality: General George Brinton McClellan. By William Starr Myers. New York: D. Appleton-Century Company, Inc. 1934. $5.00.

EARLY in 1857 George B. McClellan resigned from the Army to become Chief Engineer of the Illinois Central Railway. After graduating second in his class at West Point in 1846, he had fought in the Mexican War, had had various garrison duties, had surveyed in the Rocky Mountains, and had been a member of a commission of three officers sent to the Crimea to study European military affairs. If on his departure, his C.O. had been required to prepare a final efficiency report, he would have had many favorable comments to make. McClellan had a brilliant mind, a driving ambition and energy to use this mind, exceptionally wide experience in his profession, a record of great personal bravery in war, a reputation without a blemish. Nevertheless his C.O. could not omit conscientiously a few unfavorable entries. This

young officer was somewhat too conscious of his birth, breeding and ability. He was impatient of higher authority. Worst of all was his lack of tact. He seemed to go out of his way to offend those above him. It was also true that he was too deliberate and cautious in his work. But all these were minor defects. Had the C.O. the gift of foreseeing the future, he would have been astonished to observe the sinister results, five years later, of these very shortcomings that appeared to be so trivial.

All these traits are evident in the notable biography of General McClellan by Dr. Myers, who is Professor of Politics at Princeton and sometime lecturer at the Army War College. It is not alone a military study, in which, by the way, the author shows considerable competence, but it is a definitive life of an American gentleman of great nobility of character. It is more than a biography, however, for it is a defense of McClellan against all his enemies, past, present and future. Nevertheless in his twenty years investigation Dr. Myers has not failed to note the slight weaknesses that kept McClellan out of the ranks of the few foremost men in our history. His analysis of McClellan's character and personality is made without any attempt to exaggerate the good and overlook the unfortunate traits. His weighing of the facts of his Civil War leadership is extremely fair. If the Peninsula Campaign was a lamentable failure who was to blame? The reader must judge for himself, but the documentary evidence of political interference is unimpeachable. Yet there is always the uncomfortable feeling that McClellan was largely to blame both for the absent political backing in his campaign plans, and for his own want of political sagacity.

Dr. Myers has performed a valuable service to our military annals in writing this clear exposition of an unusual military mind. McClellan will regain some of his former glory, and there will be many salutary lessons for this generation in noting the slight margin that kept McClellan from being numbered with the first in war among our Nation's heroes. D. A.

THE RIDDLE OF JUTLAND. By Langhorne Gibson and Vice-Admiral J. E. T. Harper. New York: Coward-McCann, Inc. 1934. $4.00.

DO not make the mistake of starting this book with the idea of putting it aside in a few minutes to attend to something urgent. It is the story of the greatest sea fight in history, of stout ships and good men strained to the limit of earthly achievement—not for some paltry advantage, but for the very existence of nations. The exploits of legendary heroes are slightly insipid compared with those of Jellicoe, Scheer, Beatty, and Hipper on that spring day of 1916. Generals can make mistakes and retrieve them later; indeed excellent precedents in this respect have been established by the very best people,—Caesar, Napoleon, Cromwell, and it is possible that some modern names could also be included. But off Jutland Bank a slip for Jellicoe would have been fatal. To the eternal glory of the British people, their Admiral, under the most exacting conditions that have ever been imposed upon a man, forced the enemy from the sea before the main fleets had engaged!

It is an interesting feature of naval battles that the full significance of the event is frequently missed until time has demonstrated the nature of the results. So it was with Jutland. The English themselves, disappointed that the Imperial High Sea Fleet had escaped annihilation, were rather inclined to admit the German victory claimed by the enemy press. But the blockade was not broken, a German fleet never again ventured far from shore, the British Navy remained supreme even in the face of the ubiquitous submarine. Though Scheer escaped through the Horns Reef Channel and his ships continued to float for three years longer, he might as well have hauled down his flag on the morning after the battle. He had lost confidence in the power of his fleet to conquer; the alternative was submarine warfare, and in its wake followed America's declaration of war, mutiny, revolution, defeat, and the disappearance of German sea power.

The authors have presented a study of the Battle of Jutland that, in the light of history, is of abounding interest. The bulldog tactics of British admirals have made their navy famous for three hundred years, but as Captain Mahan points out, relatively few of her sea commanders have exhibited a true appreciation of grand strategy in the application of their power. Vice-Admiral Beatty, Commander of the Battle-Cruiser Fleet, was true to his cloth, the typical fighting admiral. But Sir John R. Jellicoe was of a different stamp; his broad comprehension of the national issues at stake, the careful preparation of his fleet, the exact maneuvers to accomplish his accurately planned strategy, all combine to make him one of the greatest naval commanders who ever lived.

Concerning Admiral Jellicoe's measures to counteract the submarine menace of 1917, the statements contained in this account positively contradict Mr. Lloyd George, who is very outspoken on the subject in the third volume of his War Memoirs. This is of interest in a consideration of the First Sea Lord, but it hardly affects a judgment of Sir John Jellicoe as a fleet commander. It also shows that even the famous War Prime Minister shared the public's lack of appreciation of the great sailor who had so brilliantly given the world its first demonstration of modern fleet tactics.

With the possibility before us of mechanized land warfare, the tactical lessons of Jutland might well be pondered by soldiers. At Trafalgar, Nelson approached the French at a rate of approximately three miles an hour. The Battle-Cruiser Fleets at Jutland came together at a relative speed of close to fifty miles an hour. Where commanders once had hours in which to make their decisions, now they are allowed a few minutes, or perhaps seconds. Also, if the correct disposition of forces has not been accomplished before the contact, the chances of success will be lost; the fog saved Admiral Scheer. Intelligence, communication, training, equipment, and careful selection of leaders are all items whose importance increases enormously with the speed of approach. Every naval encounter of the World War demonstrated this point with startling clarity, and it is not improbable that on land the same principles will have to be discovered again when fateful events in the lives of nations no longer shall depend upon the legs of weary men.

This book has all the thrill of exciting drama, and at the same time it contains the serious analysis of one of the greatest events of recent history. J. M. E.

TRIGGERNOMETRY, A GALLERY OF GUNFIGHTERS. By Eugene Cunningham. New York: Press of the Pioneers. 1934. $3.75.

EUGENE CUNNINGHAM'S works are not unknown to readers of literature on the great open spaces. Such will welcome with open arms his latest effort so aptly entitled "Triggernometry." Others, unfamiliar with his writings, but anxious to secure authentic information upon the outstanding gun fighters of the West of Yesterday, would do well to own the book.

Seventeen persons pass across the pages of Triggernometry—seventeen who wrote their stories with blood and bullets. Of these, the names of several will be unfamiliar to the average reader. Billy the Kid, Wild Bill, Lee Christmas—these we all know. But Tom Horn, "Butch Cassidy," Dallas Stoudenmire, and others among those chosen for biographical sketches are not so widely illustrious. Nevertheless, once the book is read, the reader will fully approve the author's choice of his entire *dramatis personae*.

Mr. Cunningham, unlike so many others who write upon the lurid days of the last frontier, has sought, and constantly endeavored to expound, the truth, the whole truth, and nothing but the

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truth. He explodes most thoroughly the historic fable of Wild Bill's "titanic" struggle with the "McCanles Gang,"—and leaves that hero a sorry spectacle in this particular affray, at the same time accrediting him with sufficient other really estimable exploits to make his memory linger not discreditably. Billy the Kid, too, he debunks, without conveying in the least the impression that he is unworthy of a place in the gunfighters' Hall of Fame.

One or two of the author's statements are open to discussion. Thus, in his preface, he says that, "according to men who were on the spot, Cody (Buffalo Bill) didn't arrive on the ground until the day after the Yellow Hand killing!" Yet General Charles King, U. S. A., who retained his mental and physical vigor to the day of his death, assured the reviewer most emphatically, some four or five years ago, that he *saw* Buffalo Bill kill Yellow Hand. Which is right? Again we hear (p. 39 of "Wes" Hardin manipulating a .45 Colt in 1871. No Colt .45's were then extant, this caliber coming later into the market, though .44's were plentiful.

But the book is, in general, remarkable for its correctness; it is pleasingly free of typographical or other errors. The final chapter on "Triggernometry" per se (dexterity with the six-gun) will be devoured avidly by the stay-at-home readers of "Westerns" who have heard—and wondered—about gun "rolling," the "border shift," the "spin," "fanning," and similar forms of firearm prestidigitation. All these are correctly, and entertainingly, described.

To those whose pulses quicken at tales of the Golden West,—as well as to anyone interested in accurate and thrilling biography of colorful men of a colorful era, in short, to all men, and women too, with a drop of good red blood in their veins, the book is commended.

C. G.

ULYSSES S. GRANT. The Great Soldier of America. By Robert R. McCormick. New York and London: D. Appleton-Century Company. 1934. $5.00.

THE great failures of history are fortunate in that odd human habit of shrouding in clouds of glory the leaders of forlorn hopes, until the rose tinted fog becomes so thick that it obscures the less romantic figures of their successful opponents. Thus it is that the fame of General Grant has suffered from the cumulous masses of legend that have drifted around the noble characters and colorful exploits of the great Confederates. It seems incongruous that a small, round-shouldered man of the people, with "a rather scrubby look" and a cigar in his mouth, should defeat the Galahad of the South. There may be also much truth in the contention of this author that political sentiment coupled with malicious design has had a large part in diminishing the honor that is due the upstart Union General. However, such is the emotional influence of song and story, that a clear-headed reckoning of Grant's achievements has rarely been set down in the full light of accurate historical knowledge for the public to read and judge. Colonel McCormick's study fulfills this useful purpose and, while it presents little that is new, it is a sound appraisal of the man as a general. It seems strange that it should be necessary to demonstrate to us, so long after the event, that our nation during those hectic four years developed in Ulysses S. Grant one of the greatest military commanders of history.

It is well known that the personal jealousies, animosities and ambitions of Napoleon's marshals contributed materially to his downfall; and Mr. Lloyd George in recent months has been casting some light upon the effect of discordant personalities on the Allied conduct of the World War. During the Civil War, the aspirations of small men were far reaching in their consequences, as an examination of this book will show. But Colonel McCormick's scornful and often sardonic comments are bestowed with such liberality upon the long suffering "West Pointers" as to impair the effect of impartiality and accuracy; nevertheless they make good reading and create an atmosphere of headquarters

gossip that enhances the interest immensely. Grant shows up remarkably well among the petty squabbles, though his enemies were numerous and his opportunities for revenge ideal. Considering his environment, probably the trait of character for which he is most deserving of immortality is patience. When one subordinate after another failed or stupidly neglected to attempt his mission, Grant did not explode as an ordinary man might have done, he devised another maneuver against the enemy. Unfortunately his conception of military command did not include the cavalier manner; his was not a show personality. He was purely and simply a product of our Middle West. And though he made war on a scale that had never before been attempted, against veteran opponents whose generals were men of first rate ability, he has to await the dilatory researches of historians before he can take his rightful place among the great captains.

The reader closes this book with the conviction that the author has investigated his sources thoroughly and has presented a careful survey of Grant's military career. But the feeling persists that the opportunity has been neglected to show more of the man himself. Because of the tales that have spread concerning his weaknesses, and because of his lack of success as a civilian, there is a tendency to assign his victories to a phlegmatic refusal to accept defeat. The present work gives the credit to his military genius, an intangible thing and conveniently vague, while it dwells very lightly on his strength of character—that dominant feature of all true leaders of men. Genius alone would never have carried Grant through the Vicksburg Campaign.

Colonel McCormick takes some trouble to point out the shortcomings of General Sherman, which detracts from the book and adds nothing to the stature of Grant. Also there is evident a fondness for superlatives, used with such frequency that they weaken the argument materially and give an unsympathetic reader large scope. A chronological table of Civil War battles is a thoughtful and valuable addition to the book, and the many excellent maps are most useful. Military students cannot afford to miss this realistic study of General Grant. J. M. E.

THE NAVAL MEMOIRS OF ADMIRAL OF THE FLEET SIR ROGER KEYES. The Narrow Seas to the Dardanelles. 1910-1915. New York: E. P. Dutton & Co. 1934. $5.00.

ADMIRAL KEYES was a first-class fighting man in the World War, and his memoirs prove him to be a first-rate writer. Over three hundred pages of this volume are devoted to the Gallipoli Campaign. As Chief of Staff to the Commander of the naval forces, Keyes was an active participant in the early naval actions at the Dardanelles and the later combined operations. His brilliant descriptions of the plans and operations, his fearless analyses of the causes of failures make his book a contribution of unparalleled value to the history of the Dardanelles campaign. He was an ardent champion of the utility of this "side show" and firmly believed in the practicability of bringing it to a successful conclusion. His arguments and point of view are extremely convincing, even to one who always questioned the wisdom of the Gallipoli diversion.

The book is one of the most intensely interesting among the memoirs of World War leaders that has yet appeared. It is melancholy evidence of the lack of proper appreciation of amphibious power. D. A.

INDUSTRIAL RADIOGRAPHY. By Ancel St. John and Herbert R. Isenburger. New York: John Wiley and Sons, Inc., 1934.

"INDUSTRIAL RADIOGRAPHY," aims to furnish "in readable form authoritative information concerning the practical use of radiography for industrial service."

This is truly a laudable aim and the book does, in the main, accomplish its simple intent. The information furnished covers standard practices of exposure and photographic technique with

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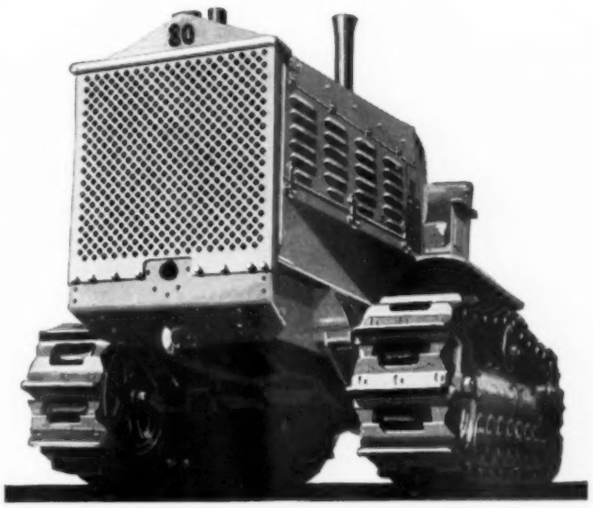

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additions here and there of special methods developed in the St. John laboratory. This sort of information collected so as to be readily available in book form is of great convenience to the technician, and of benefit to the student who is entering the field of radiographic testing. It is also of convenience and benefit to the metallurgist who has had little experience with x-rays but who finds it necessary or desirable to use radiographic tests.

The first fifty pages, divided into seven chapters, are devoted to historical matter and x-ray theory. Perhaps this material could have been condensed to advantage. It contributes little to the simple intent of the book. The real meat of the volume is contained in the remaining 130 pages of text divided into 13 chapters. Chapter eight is devoted to machines and circuits. This section is good as far as it goes but there is not enough of it. That is, evidently the machines described are those with which the authors have had direct contact. Some description of modern ultra-high-power installation could have been added to advantage. One notices also a lack of specific information regarding various mechanisms for tube manipulation. Other possible additions could be suggested.

The section devoted to radiographic technique is perhaps the most satisfactory part of the book. It is very good and gives the beginner adequate instructions for securing passable pictures.

The section devoted to interpretation of negatives leaves something to be desired. Defects found in cast steel and in welds are described briefly, but are not specifically illustrated, except that pictures of cracks are shown. The descriptions, themselves too brief, are not of much use without illustrations. Even the cracks illustrated are not typical. The illustrations of x-ray pictures are in general poor. Part of the trouble may be ascribed to the difficulty of reproduction of x-ray pictures. However, some of it is due to a poor selection of illustrative material.

The last chapter is devoted to a brief discussion of radiography by gamma rays. Here also the authors devote a disproportionate amount of space to the theory of gamma rays. The chapter could have been amplified considerably by the inclusion of results obtained in other laboratories and by a better selection of illustrations.

There are three appendices devoted to charts, tables and bibliography. This last appendix is particularly valuable since it lists the important papers which have appeared on the subject.

H. H. L.

BAUTECHNISCHER LUFTSCHUTZ. By Hans Schoszberger. Berlin: Bauwelt Verlag. 1934.

IN this book the influence exercised by the arts of war on the building of cities is traced back for several hundreds of years; the effect on city design due to improvements in weapons is logically described in an interesting manner, several plans of cities, as built and as proposed, beginning with the year 300 A. D. being illustrated, but some of these illustrations leave much to be desired.

Then follows a chapter on the character of future wars and what may be expected from the development of both offensive and defensive armaments since the World War. As the thesis presented relates principally to probable results from air attacks, stress is laid on protective designs for buildings and refuges situated to the rear of the battle front.

The author divides the buildings to be protected into four classes, viz.: Class I. Industries pertaining to necessities, such as water, light, power, gas and heat; railroad stations and communications; important buildings, such as police and fire departments. Class II. National and municipal government buildings; buildings which accommodate large numbers of officials and employes; schools; warehouses and places of public assemblage. Class III. Homes in large cities and towns subject to air attack by reason of their location. Class IV. Homes and factories in small cities and towns, as well as on open, flat terrain.

The effect of explosive bombs, their destructive area, accuracy of aim and size; chemical constituents of the explosives used, gas pressure and air waves are fully described. Building constructions for minimizing these effects are proposed.

Refuges against gas attacks are taken up in detail, and these are classified in accordance with the number of people requiring protection. Low buildings are recommended against the effects of bombing, and high buildings against gas attack, but since both cannot be provided in the same structure the properly ventilated and chemically protected underground refuge is recommended as the final solution for both problems under present conditions. The book also contains a comprehensive compendium of references on the subject.

While this reviewer cannot agree with the efficacy of all the protective measures described or proposed, particularly those to be applied in large cities, this work is assuredly of intense interest to all students of modern warfare. F. H. W.

SEA POWER IN THE MODERN WORLD. By Admiral Sir Herbert Richmond, K. C. B. New York: Reynal & Hitchcock. 1934. $3.00.

SINCE Admiral Mahan published his famous books on the influence of sea power on history, the instruments of this power have undergone a radical change. The battleship has grown bigger and presumably better, the submarine has become an offensive long-range weapon, the airplane with its bombs has appeared as a menace in the skies. New maritime powers and new trade routes have developed. In short the time is ripe for a reconsideration of the underlying principles involved in this problem, the sound solution of which is essential to national security.

Admiral Richmond, who at present occupies the chair of Naval History at Cambridge, is the author of many authoritative books on naval warfare. His views are entitled to a respectful hearing outside his own country. He is frequently at variance with our own naval experts on the question of the ideal tonnage of various types of ships, but his arguments in upholding his own views have much historical backing and are very plausible. He is convinced that bigger ships do not mean better ships. The large ship has not made nations more secure, but it has cost the taxpayer vastly more. Smaller cruisers would attain the required strategic objectives and be available in greater numbers for the same expenditure. In other words, in all types of ships growth in size is to be deplored for strategical and tactical reasons as well as for the administrative difficulties inherent in ships of large tonnage.

Admiral Richmond's estimate of the reasons why the various nations of the world need sea power will prove particularly interesting and timely at this moment when the naval limitation treaty is in the public mind. The book is non-technical in style and provides the layman a clear and thoughtful statement of the principles of modern sea power. D. A.

ARMAMENTS YEAR BOOK OF THE LEAGUE OF NATIONS. 1934. Geneva; Sole U. S. Selling Agents: The World Peace Foundation, Boston. $6.25.

THIS, the tenth annual edition of the Armaments Year Book of the League of Nations, is recognized as a standard reference work on world armaments. Official data have been collected from 64 nations both members and non-members of the League. The important facts about the land army, air force, navy and defense expenditures of each nation are given. A separate section deals with the limitation of armaments and—among the most important data in the book are extracts from some 38 conventions, treaties and agreements concluded between various countries in the years from 1917 to 1931. Among these are the Washington Five-Power Naval Treaty of 1922 and the London Naval Treaty of 1930. L.A.C.

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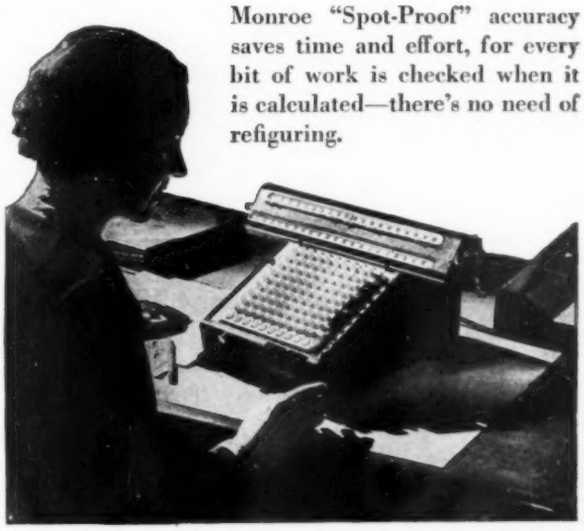

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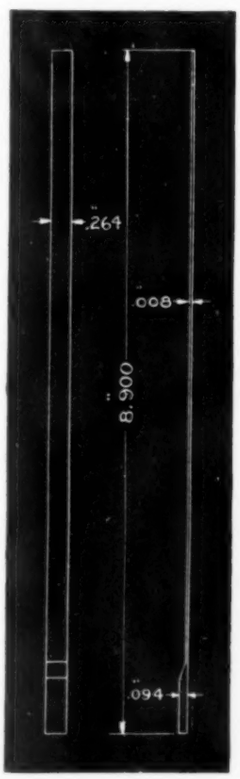

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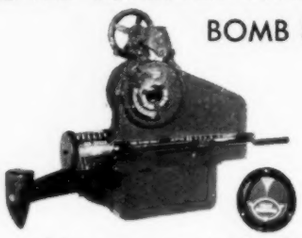

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